Vol. I MARCH, 1920 No. 12

THE PAPER INDUSTRY

The Monthly Educational Journal of the Paper Industry

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A remarkable performer. It does what no other shredder can do.

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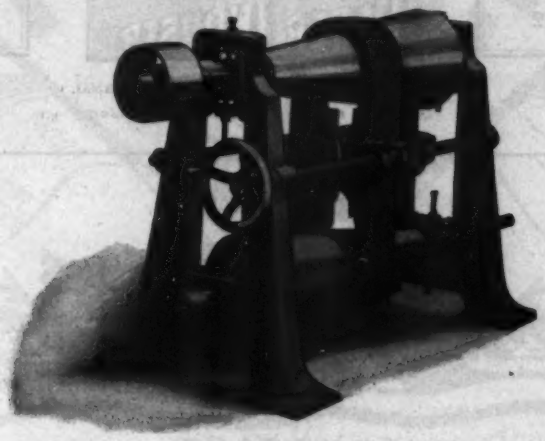

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Unexcelled for governor drives on variable speed engines.

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Vol. 1—No. 12

THE PAPER INDUSTRY

A. SCOTT DOWD
Editor

A MONTHLY EDUCATIONAL JOURNAL
Devoted to the Interests of The Paper Industry

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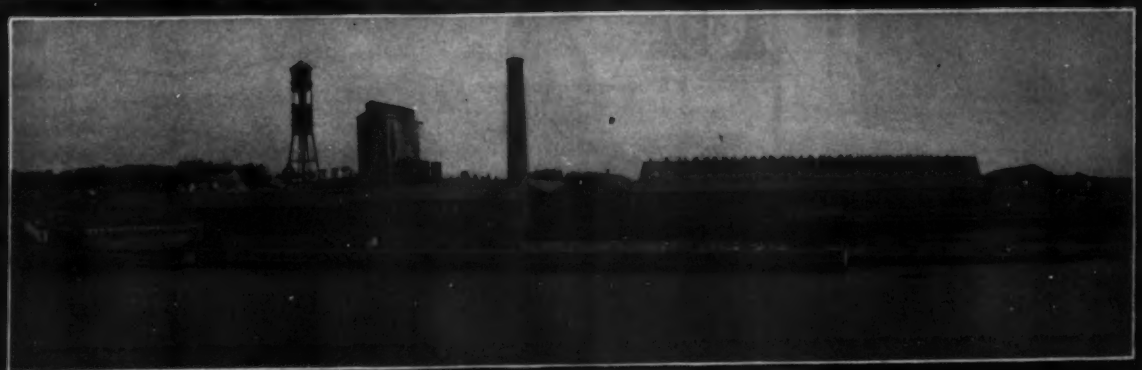

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It covers the selection and use of the cheapest grades to paper and cover stock De Luxe, and every size and weight known to the paper business.

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The "Dollar-a-year" idea applied to your lubrication problem.

During the war experts worked for nothing—at a mere formal "dollar-a-year," denoting employment—in order to apply to the great task of victory every big brain, every trained expert, every "national size" man that could be obtained.

Now, Wayne applies the "dollar-a-year" idea to the great task of bringing commercial victory to its clients.

In the field of oil storage systems, for instance, Wayne's big man is at your service and can give you nation-wide experience, through engineering training, personal ability of highest rank—and you keep the dollar.

He has a staff of Wayne engineering experts at his command and Wayne has found that customers who use this service, who apply this "dollar-a-year" idea to the problem of oil-storage, are making great strides in efficiency and plant economy and success; that this Wayne idea puts science and brains into their business to an extent never before attained.

Wayne oil storage systems include measuring and non-measuring pump, above and below ground; light and heavy metal tanks, portable wheel tanks, single units and batteries for oils, gasoline and other liquids; remote control systems, indicators, gauges and meters.

They can be best described and planned in conjunction with your known engineering problem.

The Wayne "dollar-a-year" man and his experts are at your service—big, successful, experienced brains, at no cost to you.

We invite you to write for a conference, without obligation on your part. We will be glad to send you, also, Bulletins No. 224 PI, 82 PI, 70 PI, 65 PI, and 35 PI.

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Wayne Oil Tank & Pump Co., 731 Canal St., Ft. Wayne, Ind.

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¶ Magnify it as much as you like.

¶ Make any test you wish.

¶ Examine the warp and the woof.

¶ Run it on your machine and you will always find that

"Appleton Wires are Good Wires"

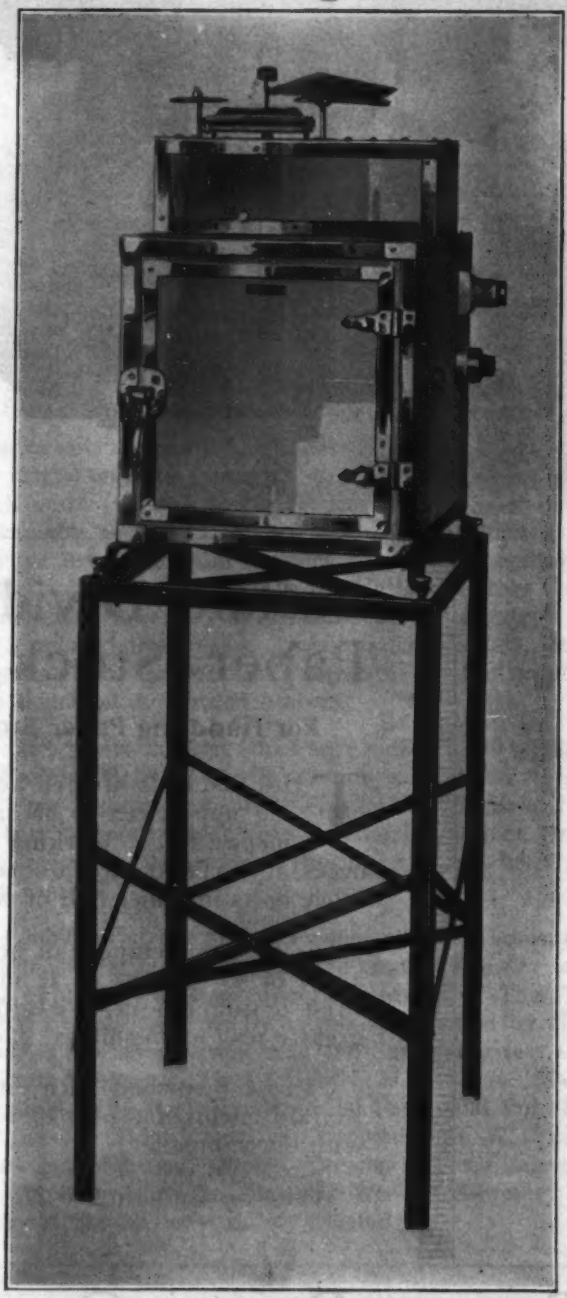
APPLETON WIRE WORKS

Appleton, Wis.

"Boys, This Will Pay Our Salaries!"

This is what the General Manager of one of the largest paper mills in this country said to the Superintendent and Boss Machine-tender after installing a

Williams Standard Paper Moisture Tester



Was He Right?

Figure it out. You know your production. If you are shipping out your paper 2 or 3 per cent too dry, figure your loss in tonnage to which you are entitled. (Tests at one mill showed a variation of 8% in moisture content.)

Other losses are:

Fuel loss in over-drying.

Production loss due to more breaks in over-dry paper.

Is over-dry paper more satisfactory to your customer? NO.

Description

A compact apparatus which will give you in 10 minutes the exact moisture of content of your paper as it comes off the machine.

Accurate to .1 of 1%.

No special skill required to operate. Anyone who can weigh roll paper or get the base weight of a sample can operate it.

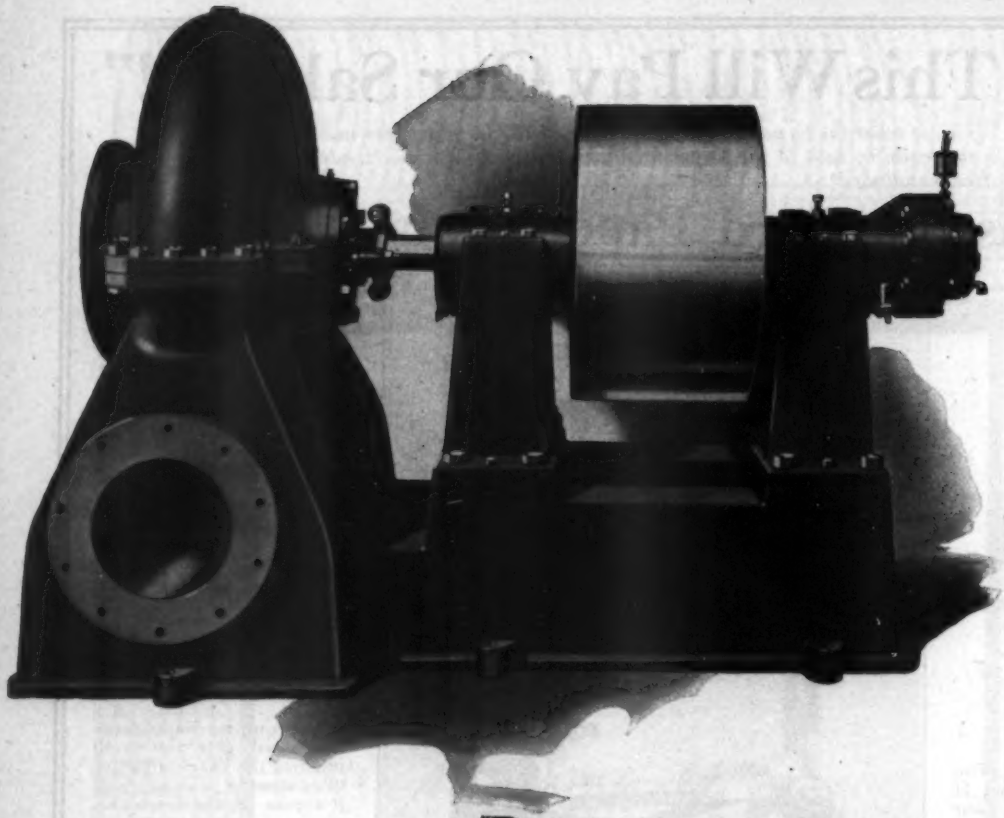
Double walled electric oven with thermostat control, accurate scales, with beam graduated to read % of moisture directly. No calculation required.

Tests all kinds of paper from tissue to board.

Every Paper Mill Can Profitably Use One or More of These Outfits. In Some Mills, One Will PAY FOR ITSELF IN ONE DAY.

Send today for descriptive matter

WILLIAMS APPARATUS CO. PARK PLACE Watertown, N.Y.



Buffalo Divided Shell Paper Stock Pumps

For Handling Paper Stock up to 4%

THE casing is divided horizontally, allowing upper half to be easily removed for inspection of working parts. It is not necessary to break pipe connections—simply remove bolts in upper half of suction flange.

Discharge opening can be furnished at an angle of 45 degrees up from horizontal if desired. Stuffing boxes are split and water cooled greatly prolonging life of packing.

Can be furnished with either the standard Buffalo enclosed type paper stock impeller-or with open impeller.

Write for Bulletin 953-27.

Buffalo Steam Pump Co. Buffalo, N. Y.

Manufacturers of Steam, Power and Centrifugal Pumps and Condensers.

New York
Boston
Philadelphia

Pittsburgh
Cleveland
Detroit

Chicago
St. Louis
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New Orleans
Atlanta
Minneapolis

Denver
Salt Lake City

EDITORIAL

A Special Safety Department for The Paper Industry Readers

THE PAPER INDUSTRY is pleased to announce the consummation of an arrangement with the National Safety Council, whereby we shall be enabled to conduct a special safety department starting with the current issue of this publication.

In this department, there will be published in each issue during the year 1920 a special article on some phase of safety, or its allied subjects. This department will make available to the readers of The Paper Industry, in large measure, the valuable service of the National Safety Council — the nation's clearing house for information on accident prevention, sanitation, industrial health, and allied subjects. Inasmuch as the National Safety Council is a non-commercial association of some four thousand of the country's largest industrial concerns, industrial agencies, technical schools, etc., its membership includes the great bulk—if not the aggregate—of the safety engineering knowledge and talent of the United States.

During the next twelve months, The Paper Industry will publish articles prepared by the National Safety Council on such subjects as "Fire Causes and Prevention"; "Fire Extinguishment"; "Fire Drills"; "Exits and Fire Alarms"; and various others promoting safe conditions and practices. In view of this fact, we are introducing the series in this issue with a brief history of the National Safety Council.

More than a hundred of the principal paper mills in the country are members of the National Safety Council, including practically every paper plant that is doing successful accident prevention work. Readers of The Paper Industry will be interested to note that the industries represented by this publication are well represented in the management of the National Safety Council, and in its annual congress programs. Thus: Robert M. Altman, Marathon Paper Mills Co., Rothschild, Wis., is chairman of the Paper and Pulp Section of the Council, and a member of its Executive Committee; G. W. Dickson, Riordan Pulp and Paper Co., Montreal, Quebec, Canada, is Vice-Chairman; and N. S. Stone, Wausau Sulphate Fibre Co., Mosinee, Wis., is Secretary of the Paper and Pulp Section of the National Safety Council.

Pulpwood in the Hudson River on its way to a big paper mill, indicating in a small measure the vast quantities of pulpwood taken from the forests of Northern New York to be made into print paper.

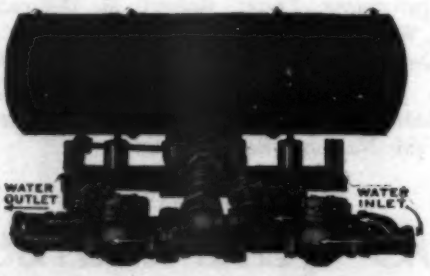
Farnsworth Systems Help Guard Against Shortage of Print Paper as Well as Coal

The shortage of news print paper as well as coal has been a serious problem of the day. Farnsworth Closed Systems for handling condensation guard against both conditions. Many paper mill men now realize that the Farnsworth Forced Steam Circulation System is necessary to speed up their production and meet the national demand for more news print paper, for by pulling the water and air from dryers it provides a constant, even, known condition at all times, thereby increasing production.

The coal saving features are numerous. The entire system is closed up, conserving heat units, and all individual traps are eliminated. The Farnsworth Closed Loop Boiler Feeding System for power plants of all kinds reduces maintenance costs by eliminating boiler feed pumps, vacuum pumps, receiving tanks, hot wells, feed water heaters, lubricating oil, much piping, etc.

"Save coal—Speed up your production" has been the Farnsworth slogan for years. **The Farnsworth Company, Conshohocken, Pa.**, solicits your inquiries and will be pleased to make recommendations for a Closed System installation at your mill. Pulpwood and coal are getting more scarce every day. The Canadian-Farnsworth Company, Toronto, Ont., Canada, is now meeting the demand for our Systems in the Dominion. Paper mill men cannot afford to overlook the two big features of the Farnsworth Forced Steam Circulation System, which are

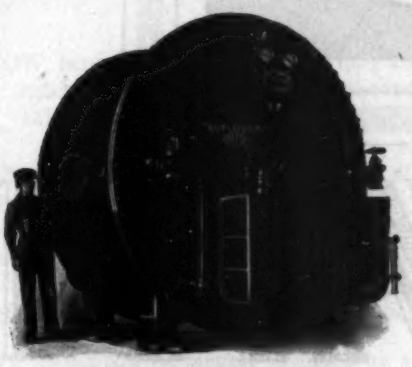
Save Coal—Speed Up Your Production



"The Sign of Fuel Saving"

"BUFLOVAK"

Recovery of Sulphite Waste Liquor



"Buflovak" Horizontal Tube Evaporator.

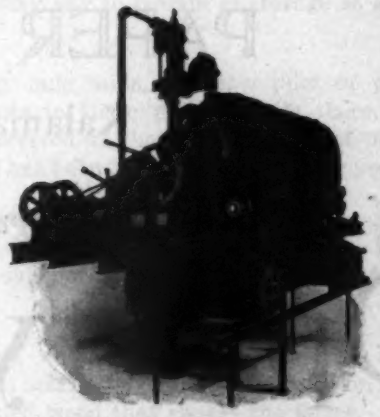
THE recovery of sulphite waste liquor from paper mills is one of the important fields developed through the "Buflovak" Vacuum Drum Dryer, which converts the liquor into a dry powder at a very low cost, thereby yielding a handsome profit. We will gladly send you details regarding the necessary equipment.

DEPENDABILITY OF OPERATION

high quality of products, long life and low maintenance costs have secured the adoption, by leading manufacturers, of

"BUFLOVAK" AND "BUFLOKAST" PRODUCTS

"Buflovak" Vacuum Dryers } For all materials
"Buflovak" Evaporators } and capacities.
Leaching Cells, Causticizers, Digesters, Vacuum Pumps, Condensers, etc.,
"Buflokast" Chemical Apparatus.



"Buflovak" Vacuum Drum Dryer.

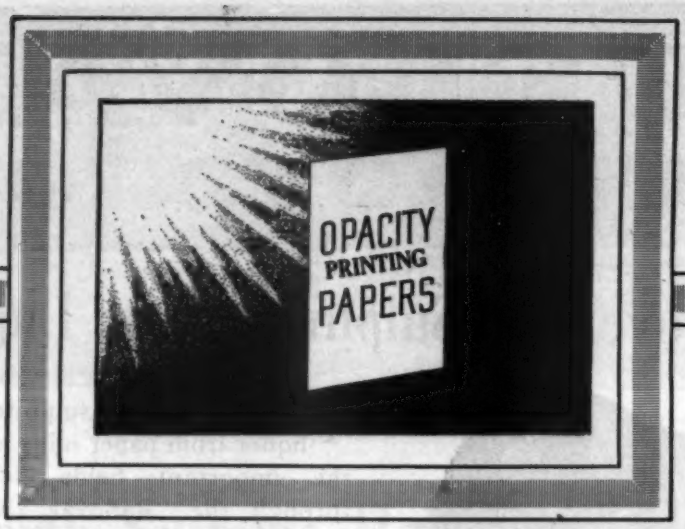
Catalog mailed on request

BUFFALO FOUNDRY & MACHINE CO.

1599 Fillmore Ave. BUFFALO, N. Y.

New York Office: 17 *Battery Place*

"BUFLOVAK"
Vacuum Dryers



BRYANT

PAPER COMPANY

Kalamazoo, U. S. A.

World's Largest Manufacturers of

Opacity Book and Catalog Papers

PLANTS OF THE BRYANT PAPER CO., KALAMAZOO, MICH.

Pulp Output Reduced by Long Storage

HOW large a loss may be caused by decay in pulp wood through storage was learned in recent observations conducted by the Forest Products Laboratory at a sulphate pulp mill.

Pulp wood which yielded over three and one-half tons per digester when used green, after a year's storage yielded only three tons. Some which had been stored for from two to three years yielded only two and one-half tons per digester. These losses in production, amounting in the latter case to over 25 per cent, occurred without any compensating reduction in operating expenses. Hence the monetary loss was fully equal to what the loss product would have sold for f. o. b. mill.

Such losses can be largely reduced by so operating the wood yard that the wood is used as nearly in rotation as possible, without allowing any to remain in storage as long as one year.

Some time ago the writer visited one of the large pulp mills, and saw piles of pulp wood, and was told that there was about 50,000 cords in these piles. While there, he noted that some pulp wood that was just being received was being piled on top of these enormous piles, and was told that some of this wood has been there as long as three years.

While some of the mills do not have all of the storage room that they need for pulp logs, it would seem to be much more profitable to go to some extra trouble to make new piles of the incoming logs, so that the fresh wood would not be stored on top of that which has been there for some time.

If a rule was adopted whereby the oldest wood would always be used first, this would to a large extent limit the tremendous waste and loss by fungi, deterioration and possible fire from combustion, as it is the old and rotted wood that causes the latter. We believe this is one of the most important subjects for the pulp mills to consider along the lines of efficiency and conservation.

1. Lifts higher (2½ to 6 inches).
2. Lifts easier (never takes 2 men).
3. Lifts with handle in ANY position.
4. Lifts and lowers VERTICALLY.
5. Vertical dash pot—can't leak.
6. Stands the gaff.

The Jacklift Is the Paper Truck

Read the Evidence from Users

Lewis-Shepard Co.:
"We have your letter of the 27th with reference to the service we are securing from your trucks.
"In reply beg to state that these trucks are giving us the utmost satisfaction, and we have had other trucks submitted to us for trial, but have come to the conclusion that your trucks will serve us 100%. This is indicated by the orders received from us from time to time. The writer is rather surprised himself on investigation, to find that you are not favored with orders for repair parts; this is the only equipment in our mill that does not require constant repairing!"

National Paper Products Co.
A. E. Mandel, General Manager.

Lewis-Shepard Co.:
"In reply to your favor of February 9th, we wish to say that we have experienced great satisfaction with your Jacklift trucks, both for the purpose of unloading pulp from cars and into our mills on skids and also for the purpose of trucking sheet paper in our mills."

Crocker, Burbank & Company.

Lewis-Shepard Co.:
"We have your letter of the 27th inst. in regard to the Jacklift which we recently ordered from you.
"We have not had any trouble with this Jacklift up to date and it works better than any make which we have ever used."

Federal Paper Board Co.
H. T. Brown.

Nothing could be more convincing than such testimony from those who have used not only Jacklifts but who have used them after an experience with other elevating trucks.

If you are using elevating trucks other than the Jacklift surely you will wish to satisfy yourself that you are getting all that's possible in the use of the platform system. Try the Jacklift—the Paper truck. With Jacklifts you **perfect** the platform system. If you are not using elevating trucks and can use them you are missing thousands of dollars a year.

Write for Jacklift catalogue. Capacities from 2000 to 8,000 pounds. Over 1800 users

LEWIS-SHEPARD COMPANY

569 E. First Street — Boston 27, Mass.

Offices in Principal Cities

Newsprint Manufacturers Attention—

Is your basement full of Dry or Wet Broke?

The Unkle Improved Extractor

Will make it possible for you to keep your basement clean and immediately return all the Broke to the Chest ready for your Paper Machine.

It's a Bear on Ground Wood in laps, Frozen Ground Wood, in fact, no mill using Ground Wood in any quantity can afford to be without it.

50 per cent saving in power. *100 to 300 per cent increased production*

A FIFTEEN DAY TRIAL PERIOD WILL CONVINCE YOU

We have running over 150 machines in Box Board Mills. We are just starting on The Newsprint Mills but have already installed two machines at Abitibi, one Machine at Laurentide, one machine at Watab and the Cliff Paper Co. has given us their order for this month. *Write for particulars.*

The Griley-Unkle Engineering Co.

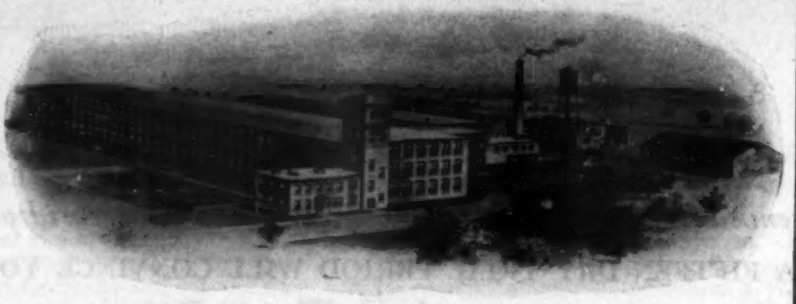
210 Central Building **FORT WAYNE, INDIANA**

"ALBANY" Felts *and* Jackets *for* Paper & Pulp Mills

ALBANY FELTS are adapted for every type of Paper and Pulp Machine, and for every kind of stock. Every one is made of Pure Wool of the very best quality.

¶ Twenty-five years' experience in making Paper Makers Felts and Jackets has shown us how to make them as best suited to the needs of various kinds of machines and stock.

¶ Every possible effort is made to give our customers the best satisfaction and to weave into our Felts and Jackets the longest possible life.



ALBANY FELT CO.
ALBANY — NEW YORK

Is There a Market Price for Paper?

"WHEN you think the market has gone to the utmost height, that it can't possibly go any higher, and you have little spare tonnage over and above your contracts, and you are wondering what you are going to do with it—and along comes a representative of a publishing house and offers you 11c a pound for all you have to sell—'ain't it a grand and glorious feeling?'—especially when you got only 9½c for your last sale."

We are offering this with apologies to Briggs, but this is substantially what a modest print manufacturer said to us recently, and all of this illustrates a certain phase of the paper market which is that the manufacturer doesn't know any such thing as a market price today, and to a greater and greater degree the prices being paid are the results of offers received from the consumers of paper in all departments of the industry.

News print still holds the banner place and will so continue for some time to come, for the only thing which could change the situation would be a drastic curtailment of advertising or a radical increase in production, neither of which is a likely eventuality this year. With ground wood alone selling at 3½c per pound (100% higher than the finished product, news print, sold for four years ago), and with a decline in the production of wood this past winter, the continued high price in news print looks like a foregone conclusion. In the wrapping paper division, production is still under the monthly shipments into the market.

There are no stocks in the country. When the Armistice sounded there were in the hands of jobbers and consumers in the United States the only reserve stocks of paper in the world, but they went to work foolishly—particularly some of our large Western jobbers—and cleaned their stocks out, advising everyone else to do the same, refusing in the meantime to reorder, thus compelling some of the mills to shut down, and the others to run on half time. For that piece of foolish bull-headedness the paper industry is now paying a severe price, and the consumers are having to scramble for their supplies, and will continue so to do for some time to come.

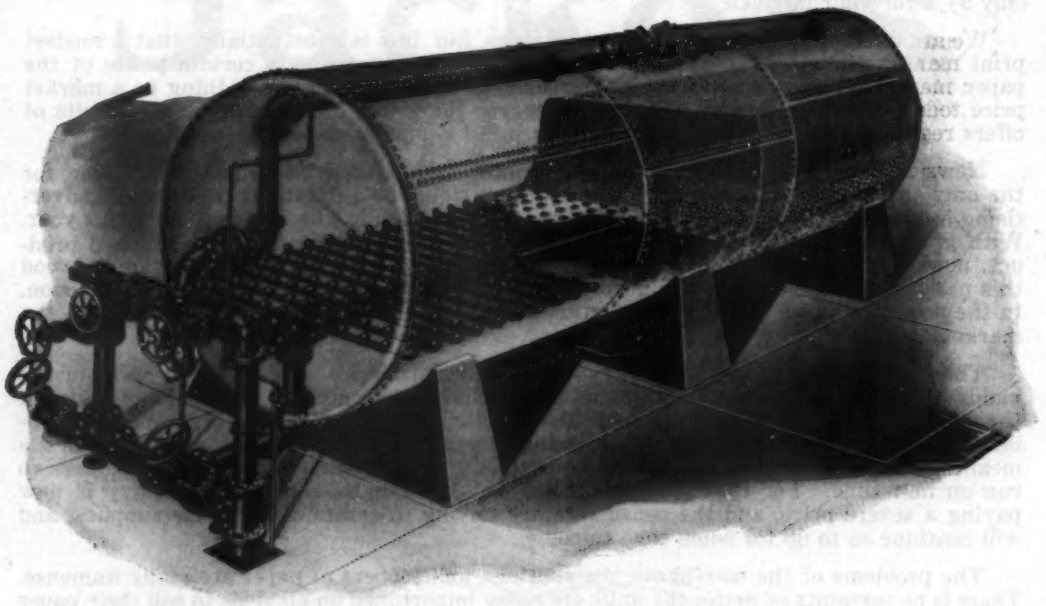
The problems of the merchants, distributors, and jobbers of paper are really immense. There is no certainty of price; the mills are being importuned on all sides to sell their paper to the highest bidder rather than the oldest customer. This is producing some new alignments and relationships, for in spite of the so-called ethics in the paper trade (ethics that have been insisted upon by every mill or jobber as their interests appeared paramount), the jobbers are saying to the mill that has had a permanent connection, "We have people who will pay $20 per ton more than you get from your regular connection. Why shouldn't you sell to us?"

That makes a pretty healthy argument, a hard one to combat successfully, especially since both the mills and the jobbers are in business to supply paper where demanded at the most profitable price. Some of the mills are replying, "Yes, we see no reason why we shouldn't sell to you as long as you pay us a premium over the market, and we can't see why we are under any obligations to sell our product to a regular customer at a price of $20 per ton below what we can get from others."

And the very tautness of the situation is helping to bring about this market situation, for both jobbers and mill men are beginning to see that there will be no immediate or precipitous decline in values; in fact, the deflation period of the paper market has not arrived, and it looks as though it might be postponed for an indefinite period. Therefore, with a wide open market on paper, and with consumers who need paper certain they can obtain it if they pay the premium required to get it, with a market the dominant features of which are the overwhelming demand and the short supply, it is certain that the coming spring and summer will see some very interesting developments in prices.

GRAVER
Water
Softening & Purification
HEADQUARTERS

GRAVER *Filters for Paper Mills*



Graver Water Filters will deliver properly clarified water for every paper mill demand.

Graver Service begins with filling your request for information, extends through the analysis of your water conditions, provides for the proper installation and starting of the correct equipment, and continues throughout the full term use of the equipment.

Write for further information regarding the various types of Graver Filters.

GRAVER *Corporation*

(WM. GRAVER TANK WORKS · FOUNDED 1857)

Steel Tanks and General Steel Plate Construction
Water Softening and Purifying Equipment

East Chicago, Indiana (3M)

Good Lighting Reflects Itself In More Production

—production in an improperly lighted plant may be speeded up as high as 35 per cent by the substitution of proper lights and reflectors, says an illumination authority in a recent article. Facts scientifically arrived at prove the accuracy of the statement. In its direct bearing upon the vital questions of human output, correct industrial lighting is as important as correct industrial housing.

To assist industrial managers in promoting production through correct general lighting, ten of America's leading electric lamp manufacturers, after extensive investigation, study and experimentation, agreed on a standard reflector for general industrial lighting, known as the R. L. M. Standard Reflector. This, together with a typical R. L. M. Standard Reflector installation, is shown above.

We specialize in the production of lighting equipment in keeping with modern lighting standards. Our illuminating engineers are at your service. Full information will be gladly sent to industrial executives, or their engineers, contractors or architects.

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The following are divisions of Benjamin products on which we will be glad to send information:

- Industrial Lighting Division
- Electrical Division (including Benjamin Two-Way Plug)
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WHEN YOU THINK OF PIPING THINK OF PITTSBURGH PIPING

The Greatest Need of the Paper Industry

AN EDITORIAL BY CHARLES G. OBERLY
General Manager of the Munising Paper Company

MY answer is "Proper Organization." We hear a great deal about efficiency, but organization of workmen brings efficiency. The workmen of this industry should have the proper training under intelligent, successful Executives, Managers, or Superintendents to eliminate the wasteful methods practiced in woods operation, wood-rooms and in sulphite, groundwood and paper mills, where most of this enormous waste takes place and eventually finds its way to the sewer.

They should be taught cleanliness, which is very essential in the operation of every department of the paper industry, insuring a first class and uniform product.

With a poor organization the efficiency is below normal, and the product improperly manufactured, because of neglect and upkeep of plant and equipment.

The employees should be encouraged to make suggestions for the betterment of manufacturing conditions, and the elimination of waste.

As a rule, many workmen are afraid to make what may be a valuable suggestion, for fear that their superior will not take kindly to it. Where this state of affairs exists, the industry is in a bad way. As a whole, there appears to be a great lack of originality in the application of new methods, and the same old system practiced thirty years ago applies in many industries today. Why? Principally, because of lack of instruction and educational work needed to improve this great industry.

The Keystone
of
American Industry

THE American dyestuff industry is the very *keystone* of America's industrial and economic organization.

Twenty-four major industries producing over two and a half billion dollars of manufactured goods a year, employing over one million people and representing upwards of two and a half billion dollars in invested capital, are dependent upon an uninterrupted supply of dyestuffs, not only for their continued growth and prosperity, *but for their very existence.*

Other industries producing over three billions of manufactured goods a year, employing over a million people and representing nearly two billion dollars in invested capital, are *indirectly* dependent upon continuous supplies of dyestuffs for their maintenance.

The experience of American manufacturers during the war has proven beyond the shadow of a doubt that the only way American industries can be guaranteed an adequate supply of dyestuffs *at all times* is by building up and safeguarding *with every means at our disposal* a self-contained American dyestuff industry.

E. I. du Pont de Nemours & Company, Inc.
Dyestuffs Sales Department
Wilmington, Delaware

Branch Offices;
New York, Boston, Providence
Philadelphia, Chicago, Charlotte, N. C.

"Flexible as a Belt-Positive as a Gear-More Efficient Than Either"

THIS slogan was originated by us years ago. It has appeared in our advertising ever since, and truly describes the merits of Link-Belt Silent Chain drives.

Flexible as a Belt—

LINK-BELT SILENT CHAIN can wrap around a wheel as easily as a belt; around a small wheel, *more easily*.

Positive as a Gear—

LINK-BELT SILENT CHAIN maintains a positive contact with the wheel; the linear velocity of the chain is the exact pitch line velocity of the wheel. There is no rolling contact, as with gears.

More Efficient Than Either—

LINK-BELT SILENT CHAIN transmits its pull evenly to every tooth in contact with it. There is no one-tooth action as in gears, and no losses due to rolling friction and to the shock of transferring the load from tooth to tooth.

LINK-BELT COMPANY

PHILADELPHIA CHICAGO INDIANAPOLIS

Offices in all Principal Cities

SEND for our 128-page Data Book No. 125. It illustrates numerous applications of Link-Belt Silent Chain Drives in many varied industries and shows how to figure drives and prices. Your engineering and purchasing departments should have copies. Sent free for the asking.

LINK-BELT
SILENT CHAIN DRIVES

We believe that American business can be lifted from its present uncertainty only by constructive co-operation—the substitution of intelligent competition for blind, destructive competition.

Not Fixing Prices

The Fourdrinier Wire Manufacturers are not "fixing prices" nor attempting to "fix prices." Every Manufacturer follows his own individual judgment as to the prices at which he quotes or sells.

But Making An Open Market

Through the Bureau which directs its co-operative work, the industry has a board of trade—a medium through which the market becomes "open" by immediate publication of sales and quotations.

Questions are welcome.

Paper Machine Wire Manufacturers' Industrial Council

Directed by the Armstrong Bureau of Related Industries
11 La Salle Street, South, Chicago. Illinois

Carrying High Overratings On Natural Draft—

Boiler ratings as high as 200% can be carried with poor quality, high ash and badly clinkering coals, on natural draft, when the boilers are equipped with

Files Hand Stokers

They insure clean fires all the time, without necessitating slicing, poking through open fire doors. Moving a few convenient levers mounted on the boiler fronts sifts the ashes, cleans the fire, breaks up all clinker and dumps the refuse into the pit. The labor saving is nearly as great as the coal saving.

The illustration shows a typical Files installation. Files stokers are also furnished with mechanical feed where plant is equipped for it.

Write for full particulars on the Files now.

The Files Engineering Co., Inc.

79 Westminster St., Providence, Rhode Island

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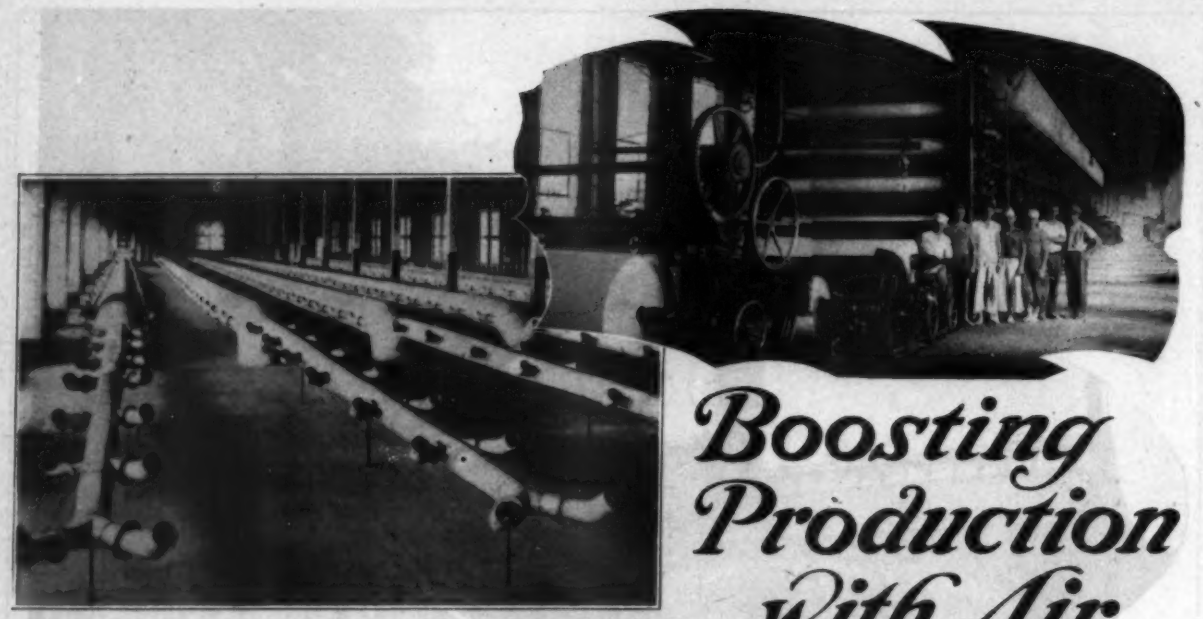

Boosting Production with Air

American Blower Equipment Dries Paper in Big Mill

IT was quite a problem at first. The quantities of paper to be handled were so great that ordinary means proved inadequate. The air used for drying was needed in large quantities and it *had to be absolutely clean.*

After considering many ideas The Buffalo Coated Paper Company approved the proposed American Blower Installation. It operated successfully from the start, and has been doing this constantly since that date.

Unlimited Adaptability

is here again proven as one of the predominating characteristics, which has put thousands of American Blower Installations to work at successfully meeting every conceivable ventilation and air-supplying requirement.

When any such problem demands your attention, no matter how exceptional it may seem to be, you are safe in submitting it to American Blower Engineers. The truth of this statement is conclusively evidenced by a long record of successful past accomplishment.

"Sirocco," means clean pure air. When that kind of air is needed, think of "Sirocco" Equipment. Investigate it. Specify it.

AMERICAN BLOWER COMPANY
Detroit, Michigan
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Branches in all large Cities

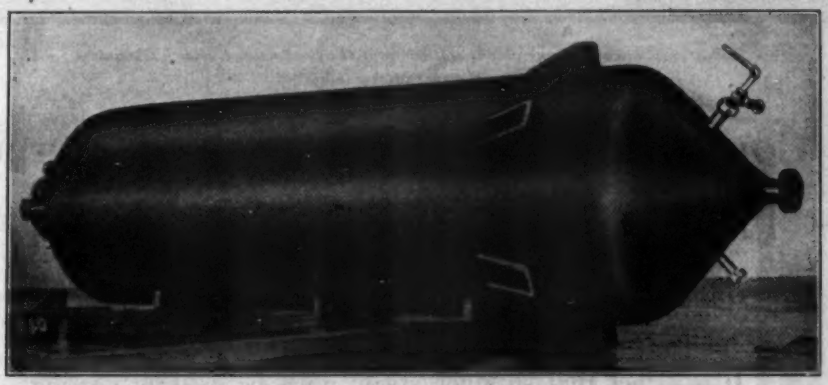
"Sirocco"
TRADE MARK

Kellogg

SEAMLESS WELDED DIGESTERS and TANKS

of All Kinds for

PAPER and PULP MILLS



Testing Seamless Hammer Forged Welded Sulphate Digester for Brown Corporation, La Tuque Mill, Quebec.

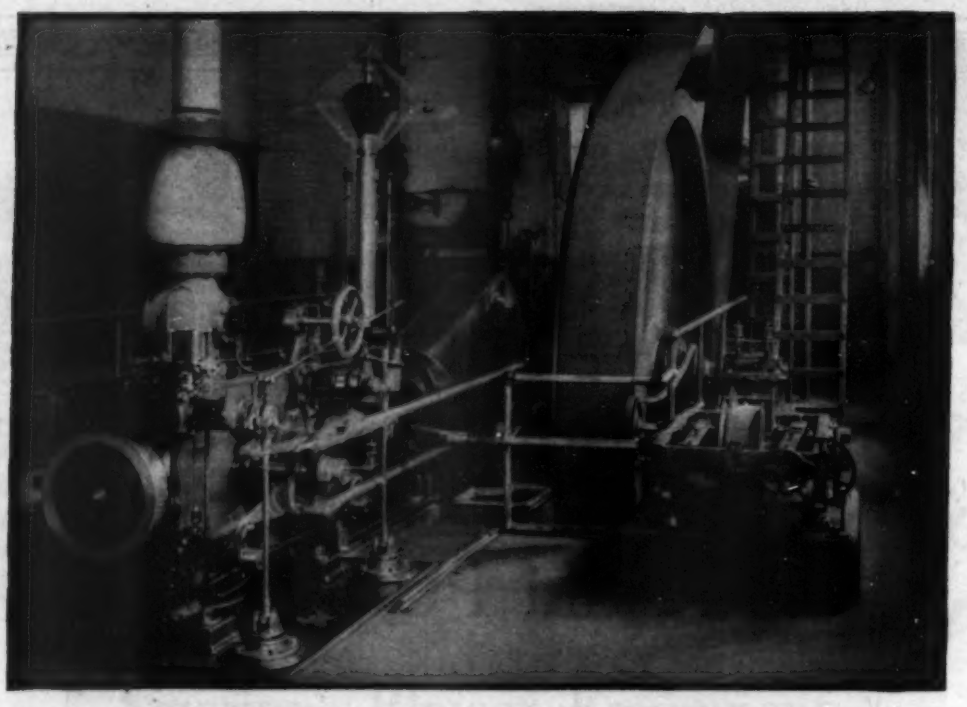
WITH your mill running 24 hours per day and still unable to meet all the demands of your customers, a leak in your digesters or tanks, causing a temporary shut-down for repairs, means a big loss to you. You will avoid all this trouble if you install Kellogg's Seamless Digesters and Tanks, welded by the Forge and Hammer Process, which produces the strongest weld of any process in existence.

We make them of any thickness, diameter or length for paper and pulp mill uses

To the man that is willing to be "shown," just ask us to prove their economy and efficiency. A letter will start the ball-a-rolling.

THE M. W. KELLOGG CO.

140 Cedar Street, New York



Hamilton Engine with variable speed device at the Boehme and Rauch Company, Monroe, Michigan

Of Course Your Requirements are Different!

EVERY paper mill power and heat installation is a separate distinct problem.

But no matter how small or large the installation, nor how involved the factors that govern power and heat, there is one big fundamental principle that determines choice.

It is a fact that so much steam must be used for heating purposes there must be a power unit that will take the energy from the steam before passing it to the heating system—and the ideal installation should include one or more

HAMILTON

CORLISS ENGINES

Apart from the efficiency of Hamilton Engines, there is a sure, steady reliability that eliminates the probability of costly shut-downs. The simplicity of design, construction and operation, the adaptability of Hamilton Engines under varying load and speed conditions in paper mills have been demonstrated over a long period of years.

Write for our new bulletin "Hamilton Corliss Engines in Paper Industry."

THE HOOVEN, OWENS, RENTSCHLER COMPANY, Hamilton, Ohio

Bleaching Wood Pulp

In this big paper mill the problem of tuberculated and corroded pipe in chlorine bleach lines was solved by the use of cast iron.

The cast iron flanged pipe shown here has been in use nearly two years and replaced rolled metal pipe which had to be cleaned or renewed entirely every four to six months.

The Superintendent of this mill says: "Besides increased efficiency in flow of bleach our junk pile has shrunk considerably during the past year and we do not expect it will ever be as large again as it used to be."

Booklet—"Cast Iron Pipe in Industrial Service" sent on request

The Cast Iron Pipe Publicity Bureau

1 Broadway, New York

MUNISING PAPER COMPANY

MUNISING MICHIGAN

MANUFACTURERS OF

MUNISING M BOND

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HAVE MADE FOR IT
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Kalamazoo Mich.

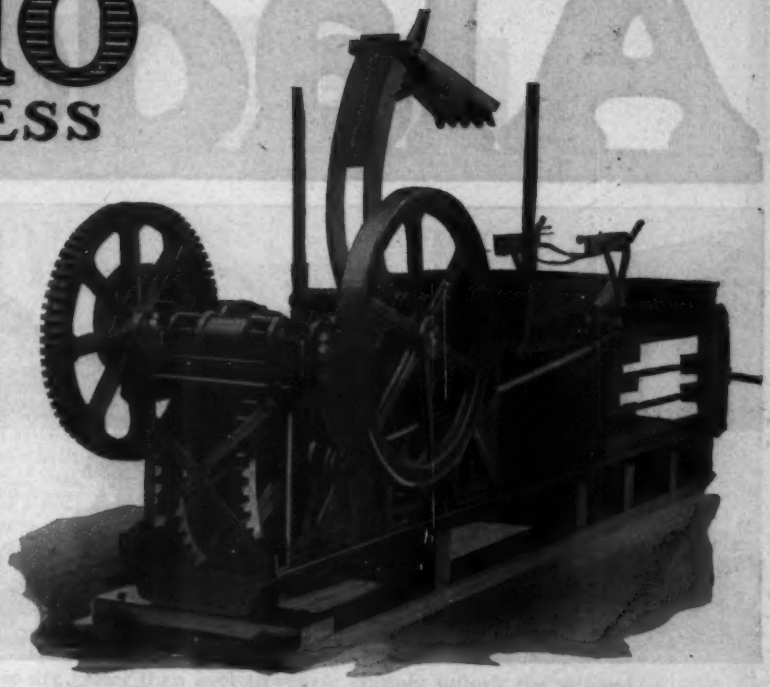
FAMOUS Ohio BALING PRESS

Time, waste and space represent money—save them.

You have paid a good price for every scrap in your place. The OHIO gives you a smooth blocky bale, neat in appearance, easy to handle and readily marketable.

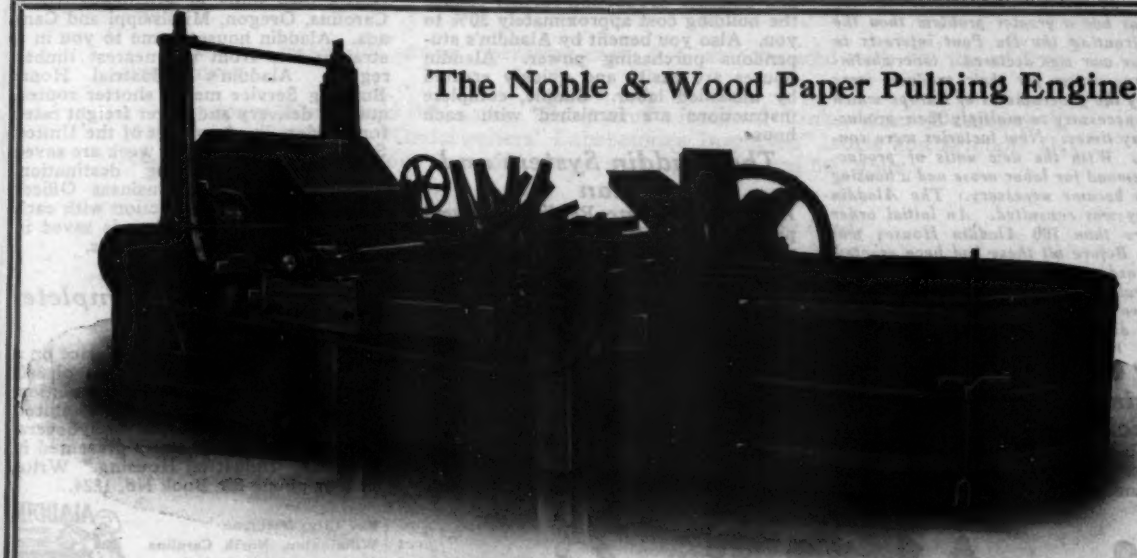
The OHIO is equipped with every possible time and labor saving device, such as Automatic Block Dropper, Relief Clutch Feeder and Friction Clutch Pulley. It occupies small floor space, yet is a giant for strength. The OHIO is a sturdy, continuous, rapid fire baler with enormous capacity that will handle your compressible waste materials and pay for itself in a very short time.

Write us your requirements



The Ohio Cultivator *Co.*
Bellevue, Ohio

The Noble & Wood Paper Pulping Engine



SOMETHING NEW—TO HANDLE

Groundwood, Sulphite, Broke or Old Paper Stock

LET US TELL YOU ABOUT IT

THE NOBLE & WOOD MACHINE COMPANY

Hoosick Falls, N. Y.

Aladdin

Aladdin Helped Du Pont Increase Production to War Requirements

Possibly no other manufacturer in the world has had a greater problem than the one confronting the Du Pont interests in 1914 after war was declared. Overwhelmingly large orders for their products were placed by the governments of Europe which made it necessary to multiply their production many times. New factories were constructed. With the new units of production a demand for labor arose and a housing program became necessary. The Aladdin Company was consulted. An initial order for more than 100 Aladdin Houses was placed. Before all these had been erected, another order was given. And in the course of several years three complete communities were erected by The Aladdin Company at different sites of the Du Pont industry. What Aladdin has done for the Du Pont interests it can do for you.

Housing Your Men Well and Quickly at Lowest Costs

The Aladdin System of Construction saves 18 per cent of the lumber wasted in ordinary building. Standardization and quantity production further reduce the building cost approximately 30% to you. Also you benefit by Aladdin's stupendous purchasing power. Aladdin houses are easily and quickly erected by unskilled labor. Simple, complete instructions are furnished with each house.

The Aladdin System and Plan

Aladdin houses are Readi-cut. Every piece of joists, studs, rafters, sheathing, siding, flooring, interior finish is cut to proper size, marked and numbered ready to nail in place. Sufficient material to complete more than 3000 houses is carried constantly in stock ready for instant shipment. Depending upon size of house, we load from one to three complete houses in each car.

Quicker Delivery From Our Five Mills

Aladdin houses are manufactured and shipped direct from the Aladdin Company's own mills in Michigan, North Carolina, Oregon, Mississippi and Canada. Aladdin houses come to you in a straight line from the nearest timber region. Aladdin's Industrial Home Building Service means shorter routes, quicker delivery and lower freight rates for builders in every part of the United States. Three days to a week are saved in shipments reaching destination. Complete Sales and Business Offices are maintained in connection with each mill. Fully 24 hours' time is saved in your mail reaching our offices.

Single House or Complete Cities

We will quote you a definite price on a single house or complete cities of 300, 500, 600, 1500 and 3000 population. These cities include homes, stores, churches, schools, offices, etc. Several cities are now graphically presented in our book, "Industrial Housing." Write, wire or phone for Book No. 1824.

The Aladdin Co.

Offices and Mills at

Bay City, Michigan
Wilmington, North Carolina
Hattiesburg, Mississippi
Portland, Oregon
Toronto, Ontario

Industrial Housing

ECONOMY Renewable FUSES

Easier than ever to renew

The first renewable fuses using an inexpensive bare renewal link for restoring a blown fuse to its original efficiency to be APPROVED IN ALL CAPACITIES by the Underwriters' Laboratories.

ECONOMY renewable Fuses have a long and distinguished record for giving dependable protection, high efficiency and low operating costs in use on electrical circuits in paper mills, pulp plants and saw mills all over the country.

Economy renewable Fuses are easier than ever to renew. Simply unlock the winged washer, remove the fused link, insert a new Economy "Drop Out" Renewal Link, relock the washer and the fuse is ready for continued service. No loss of time, no inconvenience, no waste, for all that is destroyed in a blown fuse is the inexpensive strip of fusible metal.

Economy Fuses cut annual operating costs 80% as compared with the use of "one time" fuses.

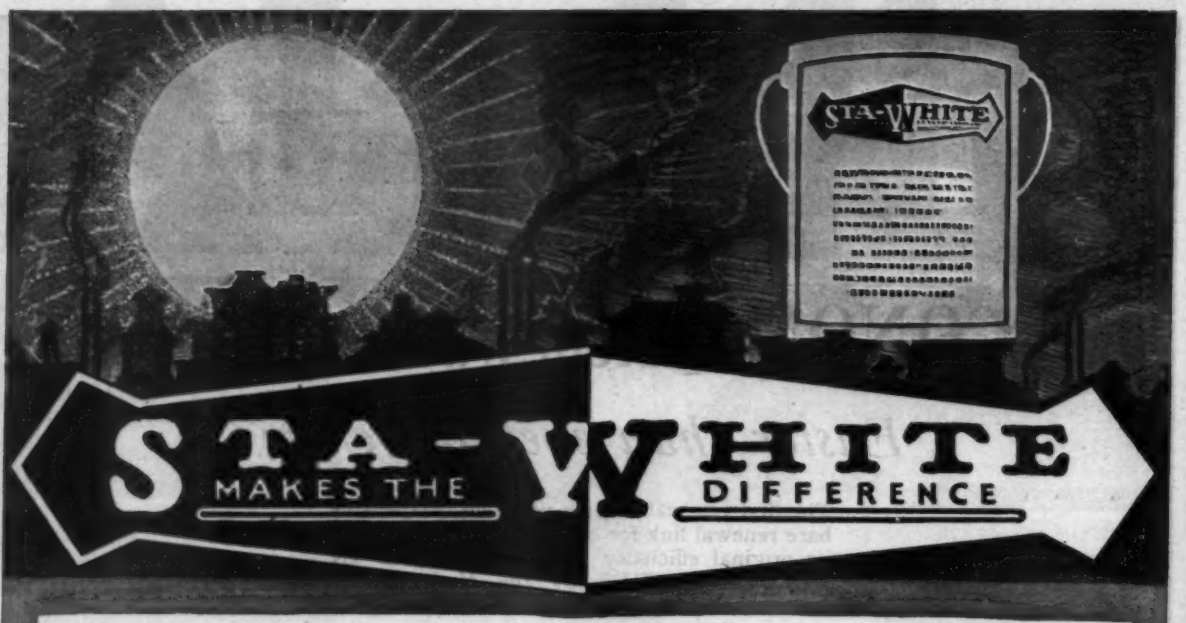
Economy Fuses and Economy "Drop Out" Renewal Links, since December 1, 1919, have carried the "Underwriters' Laboratories Inspected" labels and symbols IN ALL CAPACITIES—from 0 to 600 amperes in both 250 and 600 volts.

Install Economy Fuses at once. Sold by leading electrical dealers and jobbers everywhere.

Economy Fuse & Manufacturing Co.

Chicago U. S. A.

Economy Fuses also are made in Canada at Montreal



Partners In Efficiency

The effectiveness of lighting systems is always increased through the use of Sta-White—the pure white oil paint for industrial interiors.

Sta-White is recognized as a leader in the field of mill whites because of:

Manufacture:

Manufacture under proven formula assures unfailing high quality.

Service:

Sta-White reflects and diffuses all the light. It will not turn yellow in service—does not chip or crack and the finish is washable.

Low Maintenance Cost:

Sta-White is a worthwhile investment because its proven durability assures maximum service—eliminates frequent repaintings and reduces the ultimate cost to a minimum.

Increase the light in your plant through the use of Sta-White. It stays white the year round and can be used without the hazard of experiment.

Economically Applied by Air or Brush

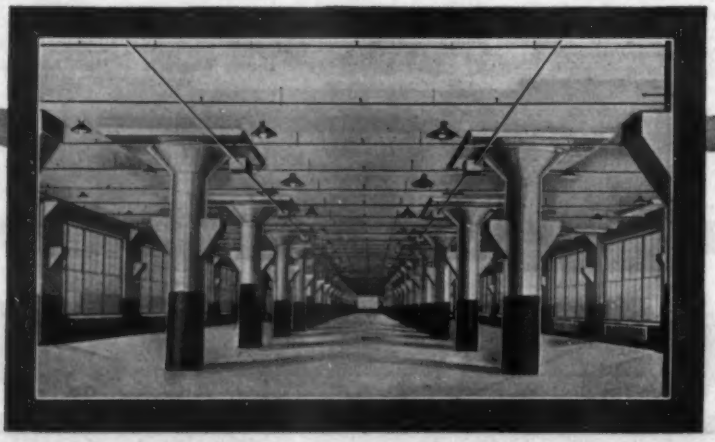
DETROIT GRAPHITE COMPANY

Makers of
Paints in all Colors for all Purposes

118 TWELFTH ST. DETROIT, U. S. A.

Offices and Warehouse Stocks in all Principal Cities

Manufactured in Canada by
Dominion Paint Works, Ltd., Walkerville, Ont.



Couching Properties of Wet Felts

Comparative Efficiency of All Wool and 90% Wool 10% Cotton First Press Felt

By F. C. CLARK* AND A. G. DURGIN†

The demand for a felt of greater tensile strength was the occasion for this test, which proved that, though an added strength existed in the mixed material, the advantage gained was not sufficient to offset the other objections. It is proposed to make further samples and tests with an added material other than cotton in which greater improvement may yet be found.—Editor.

THIS investigation was undertaken to demonstrate the practicability of substituting felt containing 10% of cotton and 90% of wool, for the usual 100% wool felt machine clothing. There are two factors which determine the value of a felt; namely, its couching properties and its life. The present investigation deals entirely with the first variable. Two felts of identical weave, and approximately the same weight, were furnished by a manufacturer of commercial machine clothing. The only identifying marks of these felts were the usual numbers woven into them, and the composition of the felts was not known by the operators during the experiments. The procedure employed was to run 25 beaters, 1625 pounds of uniform stock over each felt under exactly the same conditions. The width of the sheet was 17 inches, and the running time for each felt was 32.5 hours. Data on all machine conditions was taken at hourly intervals throughout the runs, especial attention being paid to the couching properties of the felts. At the end of the runs, the felts were removed from the machine, dried and the gain in weight, a measure of the degree of plugging, recorded. The paper was tinted red, so that all fibers retained in the felt would register with greater contrast photographically. By these means, a photographic record of all changes in felt appearance was obtained to supplement observations made during machine run.

Stock

Thirty-five hundred pounds of Commercial No. 2 shavings (for the most part shavings from No. 1 Mf. Ptg.) were obtained from the Government Printing Office to insure a supply of uniform raw material for the runs. The paper was sampled on receipt and analyzed with the following result:

Fiber—Mechanical wood	None
Chemical wood	100%
Rag	Trace
Ash	13.8%

Beating Practice

The following beater practice was adopted as standard for the runs. Sixty-five pounds of No. 2 shavings were furnished into the beater with the roll four rounds from the plate and the lighter raised. The furnishing time was 12.5 minutes, with a maximum tolerance of 2.5 minutes. The stock in the beater was diluted with 18.2 cu. ft. of water with a tolerance of 0.2 cu. ft., giving a beater concentration of 5.42%. Steam was introduced during the furnishing to assist in breaking up the stock, but the temperature was kept below 29C. After furnishing, the roll was lowered to plus one for ten minutes and then till it just brushed the plate. At this point, the amperage on recording ammeter was 17. At the end of ten minutes, 3 pounds of clay was added.** At the end of 40 minutes, 19 liters of rosin size was added, this volume being the amount required to bring percentage of rosin in the finished sheet to 2.0%. The rosin used in all the runs was a 3% emulsion containing 54% free rosin. Ten minutes after the addition of the rosin size, 3 grams (0.12 oz.) of erythrosine in solution was added. The function of this color, as previously noted, was to dye the fiber and filler, so that, in photographic reproduction of the felt after the run, greater contrast would be obtained, since ordinary plates are distinctly color-blind to reds and pinks. One hour before the end of the beating period, 2.5 liters of alum (equivalent to 1.10 pounds or 1.7%) was added. The beating time employed was 2¾ hours, with a tolerance of plus or minus 15 minutes. For comparison with mill practice, the furnish is translated into terms of a 1000 pounds furnish,

1000 lbs. No. 2 white shavings
46 lbs. of clay.
1.85 oz. of erythrosine.
2% rosin.
1.7% alum.

At the end of the beating period, the stock was dropped into No. 1 chest, where it was diluted further

* *Formerly in charge of Paper Section, Bureau of Standards, Washington, D. C.*

† *Formerly with the Paper Section, Bureau of Standards, Washington, D. C.*

** *Three pounds of clay was quantity required to bring the ash in the finished sheet up to 15 per cent.*

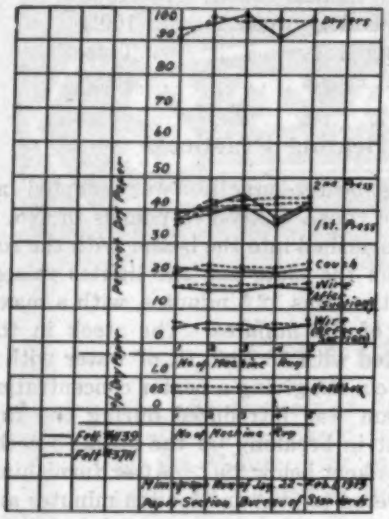
with 11.3 cu. ft. of water (tolerance plus or minus 0.5 cu. ft.) giving a concentration in the chest of 2.85%. From No. 1 chest, the stock was pumped to No. 2, or No. 3 when necessary. In no case was the Jordan used, and the pumping from the chests to the machine was in the following order: Start pumping from No. 1 and No. 2 chests, overflow returning to No. 2; continue pumping from these two chests until No. 1 is empty, when the fourth beater is dropped; open valves on all three chests, and continue pumping; No. 3, which is nearest the pump, will be emptied first, and at about the time that the fifth beater is ready to drop; No. 3 is then shut off, and pumping continued from Nos. 1 and 2 until No. 1 has become empty, when the fifth beater is dropped into it; three beaters are pumped from No. 1 chest, and one from Nos. 2 and 3 during each run; for three hours during the run, stuff was drawn from three chests, and for three and a half hours, from two only. At no time was stuff pumped from a single chest.

Machine Operation

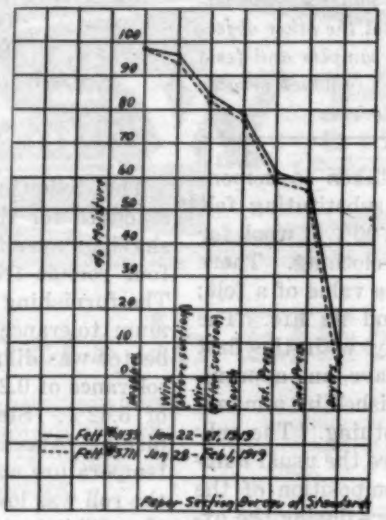
The screens were provided with .018 plates. Practically all of the stuff passed through the screens; the pitch of the wire during the runs was ½" and the speed of the machine was 36.5 feet per minute. The throw of the shake was¼" and the speed of the shake shaft was 295 R. per minute. Suction was so adjusted that the sheet was wet under the dandy (gauge reading 4 pounds). The weights on the couch were placed as far back as practical to keep sheet wet under the first press. This was done to make the couching test more rigorous. The first press felt was run under constant tension with both felts, which was adjusted by measuring the distance of stretch roll from support (9¼ bracket to bracket). By connecting a pipe to the save-all under the first press, all water was drawn off in front of the machine, and caught. This water was subsequently weighed. The second press was set in the same manner as usual in running mimeograph. The dryers were hand controlled, assisted by a Squires valve, limiting pressure to 8 pounds. The steam was so adjusted that the sheet showed no visible evidence of moisture on leaving the eighth dryer.

Weigh Sheets

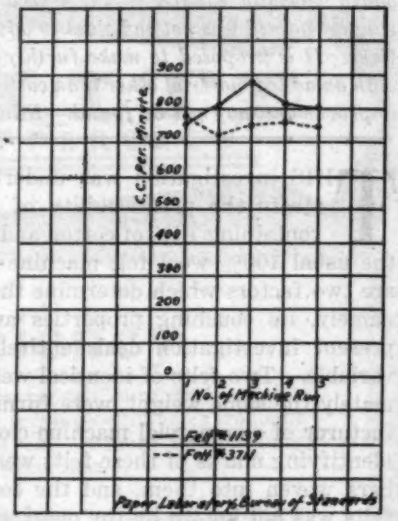
At hourly intervals, sheets were taken from the reel and weighed in order to control the uniformity of the product. Samples from front and back of the sheet were taken every half hour and tested for thickness for the same reason.



Graph No. 1
Curves showing percent dry matter at different testing stations.



Graph No. 2
Average moisture curve on machine runs.



Graph No. 3
Rate of flow from first press.

Sampling

Fifteen minutes after the run started, it was assumed that conditions had become settled and the first series of samples were taken. Samples were taken at intervals of one hour thereafter.

SAMPLE 1

Headbox. A tarred two-quart mason jar was filled from the headbox, cover screwed on tight, and immediately weighed. The volume of the sample was also taken, and the sample then filtered on the sheet machine, over a sheet of Whatman's Filter Paper to retain filler. The sample was then transferred to the electric oven, dried at 110 to constant weight, and percent stock calculated.

SAMPLE 2

Before Suction Boxes. A sample of stock was scooped from the center of the wire about seven feet from the slices. This sample was placed in a tarred can provided with tight cover. Sample was weighed

TABULATION OF SUMMARIES ON INVESTIGATION OF COMPARATIVE EFFICIENCY OF ALL WOOL AND 10% COTTON 90% WOOL FIRST PRESS FELTS

	Water from first press. Date	Weight	Time	cc per min.	Summary of analysis of Press water. Volume	Weight	SG	Dry Wt.	%	Wt. of ash	% Ash	On wet Ash %	Basis Fiber%
	1/22	291.23 Kg.	6 h. 17 m.	757	1895	1897	1.000	1.4111	.0716	-	-	-	-
Felt No 1139	1/23	31466 Kg.	6 H. 30 M.	806	1868	1849	0.990	1.4636	.0790	0.967	66.4	.0542	.0272
	1/24	32329 Kg.	6 H. 11M.	672	187 8	1883	1.056	1.7807	.0881	1.119	66.2	.0584	.0296
	1/25	30814 Kg.	6 H. 20 M.	812	1923	1927	1.000	2.0336	.1055	1.431	71.8	.0742	.0318
	1/27	30948 / 154670 Kg.	6 H. 25 M.	804 / 810	1894	1908 Av.	1.003 / 1.009	2.6561	.1396	1.999	76.7	.1052	.0344
	1/28	300.720 "	6 H. 27 M.	776	1906	1931	1.012	1.701	.0879	1.1913	71.4	.0616	.0863
Felt No 3711	1/29	283.38 "	6 H. 28 M.	729	1913	1899	0.996	1.817	.0955	1.265	69.7	.066	.0289
	1/30	294.730 "	6 H. 29 M.	758	1922	1912	0.994	2.246	.117	1.546	68.8	.0808	.0345
	1/31	297.03 "	6 H. 30 M.	762	1908	1908	1.000	1.965	.1029	1.284	65.1	.0673	.0359
	2/1	290.98 / 1466.78 "	6 H. 28 M.	751 / 795	1912	1903 Av.	0.996 / 0.9996	1.977	.1038	1.3617	63.7	.0647	.0391

	Water from first Press. Date	Weight	Time	cc per min	Summary of analysis of White Water. Volume	Weight	SG	Dry Wt.	%	Total Ash	% Ash	On Wet Ash %	Basis Fiber %
Felt No 1139	1/22	291.23 Kg.	6 H. 17 M.	757	1867	1871	1.003	.673	.0362	-	-	-	-
	1/23	31456 Kg.	6 H. 30 M.	806	1878	1868	0.994	.547	.0294	.3945	70.8	.0205	.0090
	1/24	32329 Kg.	6 H. 11 M.	817	1859	1844	0.991	.555	.0301	.3677	66.5	.0199	.0101
	1/25	30814 Kg.	6 H. 20 M.	812	1874	1859	0.991	.817	.0389	.5275	74.6	.0284	.0105
	1/27	30948 / 154670 Kg.	6 H. 25 M.	804 / 810	1878	1876 Av.	0.998 / 0.997	.870	.0463	.6033	67.5	.0322	.0159
	1/28	300.720 Kg.	6 H. 27 M.	776	1924	1897	0.986	.768	.0404	.5504	72.1	.029	.0115
	1/29	283.38 Kg.	6 H. 28 M.	729	1912	1909	0.998	.808	.0424	.4966	62.1	.0274	.0181
Felt No 3711	1/30	294.730 Kg.	6 H. 29 M.	758	1908	1895	0.994	.924	.0488	.6449	70.1	.0340	.0148
	1/31	297.03 Kg.	6 H. 30 M.	762	1797	1813	1.010	.828	.0464	.5176	62.5	.0288	.0177
	2/1	290.98 / 1466.78 Kg.	6 H. 28 M.	751 / 795	1879	1894 Av.	0.996 / 0.997	.920	.0434	.5078	63.2	.0268	.0164

	Production. Date	lbs. 6x10 1/2	lbs. trim	Dry Broke	Wet Broke Dry Weight	Average from hourly analysis. Total % Weight	Recovery	Weight 25x40,500	Mullen	Ratio	Ash	Rosin
Felt No. 1139	1/22	255.0	5711	8.5	0.45	321.05	91	61.6	16.2	26.30	10.06	1.90
	1/23	255.9	57.6	8.0	2.60	324.10	91.9	61.8	16.1	26.00	11.77	1.97
	1/24	249.5	56.95	9.6	0.55	316.60	89.7	59.8	16.9	28.24	12.27	1.77
	1/25	254.2	57.9	5.9	1.10	310.10	90.5	61.8	18.8	30.72	16.18	1.50
	1/27	250.0 / 1260.1	58.9 / 298.45	11.3 / 45.2	3.50 / 7.2	332.80 / 1613.65	95.2 / 91.46	60.6 / 61.02	13.6 / 16.32	22.43 / 26.69	16.68 / 13.78	1.88 / 1.80
Felt No 3711	1/28	253.3	52.9	9.6	1.60	327.40	92.9	59	12.4	21.03	16.06	1.9
	1/29	252.4	63.3	7.4	2.00	325.10	92.2	59.4	15.4	25.99	13.56	1.7
	1/30	256.2	54.9	13.0	2.70	326.80	92.6	59.7	12.5	20.75	16.53	2.0
	1/31	265.0	61.0	3.5	0.75	330.25	93.5	58.5	13.8	23.97	14.93	1.5
	2/1	252.3 / 1279.1	63.1 / 295.2	11.1 / 34.6	2.50 / 9.55	329.00 / 1638.55	93.2 / 92.86	59.9 / 59.12	13.0 / 13.42	22.12 / 22.77	16.24 / 15.48	1.8 / 1.7

and dried in usual manner, and percentage of stock calculated.

SAMPLE 3

After Suction Boxes. In the same manner as before suction boxes, a sample was taken after the suction boxes, and the sample procedure followed.

SAMPLE 4

Couch. The sample at the couch was taken by tearing a strip from the center of the sheet, and placing the sample in a moisture tight container. The weight of sample was then determined, and the percentage of dry stock calculated.

SAMPLE 5

First Press. A sample was taken from the center of the sheet just after it had passed the first press, and analyzed in the same manner as the sheet from the couch.

Fig. 1—Wool Felt Before Running

Fig. 2—Wool-cotton Felt Before Running

Fig. 3—Wool Felt After Running

Fig. 4—Wool-cotton Felt After Running

SAMPLE 6

Second Press. A sample was removed from the middle of the sheet, just after it had passed the second press. This sheet was weighed, dried, and the percentage of stock calculated.

SAMPLE 7

Dryers. A sample was taken after the sheet had left the last dryer, and before the reel, to see what the percentage of moisture in the finished sheet was. This sample was immediately placed in a moisture proof closed can, the weight of which had previously been determined, and the weight of sample found as soon as possible after it had been taken. The sheet was dried to constant weight, and the percentage of moisture determined.

The hourly weighed samples were put through the complete routine testing, the following data being obtained: Weight, bursting strength, radio, micro, ash, rosin.

SAMPLE 8

Press Water. A two-quart mason jar was filled with a sample of the water tapped from the save-all under first press, the water in container being thoroughly agitated before sample was taken to insure uniformity. This sample was analyzed for total solids, and for percentage of fiber, and of filler passing thru the felt.

SAMPLE 9

White Water. A two-quart sample of white water was taken at hourly intervals, and analyzed in the same manner as the sample of water from the first press.

Analysis of Results from Tests

The whole value of the series of runs was dependent on the reduction of the effects of variable conditions in manufacture to a minimum, so that the total factors affecting the wool felt in the first run would be exactly balanced by similar factors affecting the wool-cotton felt in the second run. To this end, as stated in the introduction, samples were taken at regular hourly intervals from designated testing stations along the machine, and daily averages of conditions made up.

The close agreement of stock conditions in the two runs is shown in Graph No. 1.

STATION NO. 1

Headbox. The solid line represents the curve of daily averages in concentration during the run on the all wool felt No. 1139. The daily averages were obtained from seven separate samples taken at intervals. The mean concentration of stock at the headbox for the entire run was 0.578%. The greatest variation from the mean was 0.025% on the second day and 0.048% on the fifth day.

In the second series with the wool-cotton felt, the average for the run was 0.617%. The greatest variation from the mean was 0.25% on the third day, and 0.020% on the fifth day. The averages from which the graph is drawn are:

Run 1—Felt No. 1139 All wool.	Run 2—Felt No. 3711 Cotton-wool.
0.55	0.62
0.55	0.62
0.57	0.59
0.58	0.62
0.63	0.64
Mean 0.578	0.617

STATION NO. 2

Wire Before Suction Box. This sample was, as previously stated, scooped from the center of the wire, at a point 7 feet from the slices. At this point, most of the water that would leave the sheet by gravity had left. Due to difficulty in obtaining this sample (the sampling always resulted in breakdown of the sheet), only two daily samples were taken, one an hour after starting, and the second a half hour before the end of the run. The agreement between these samples on the same day, or from day to day during the run, was so close that no more samples were thought necessary. The greatest departure from the mean in the first run was 0.15% on the first day, and 0.33% on the third day. In the second run, the greatest departure from the mean was 0.026% on the second day and 0.27% on the fifth day.

Run 1—Felt No. 1139 All wool.	Run 2—Felt No. 3711 Cotton-wool.
4.82	5.35
5.00	4.95
5.30	4.97
4.60	5.03
5.11	5.38
Mean 4.97	5.11

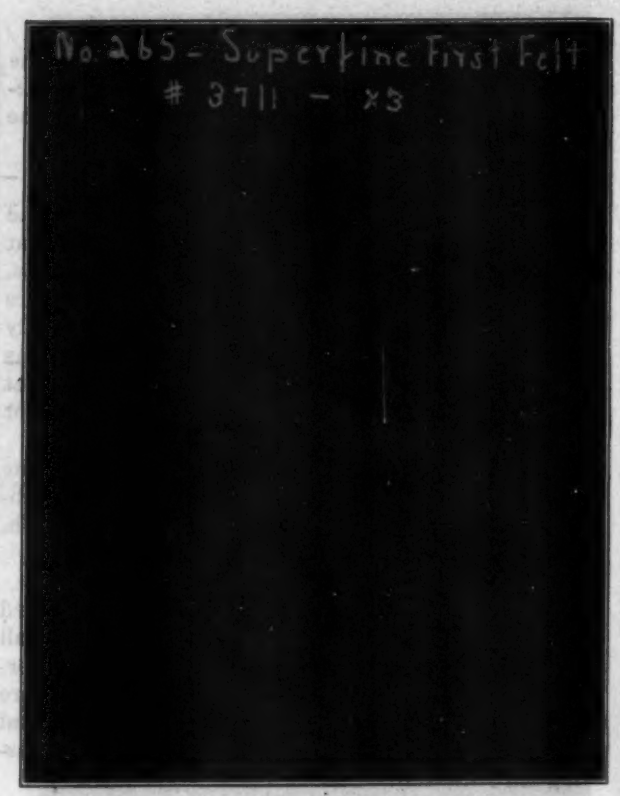
STATION NO. 3

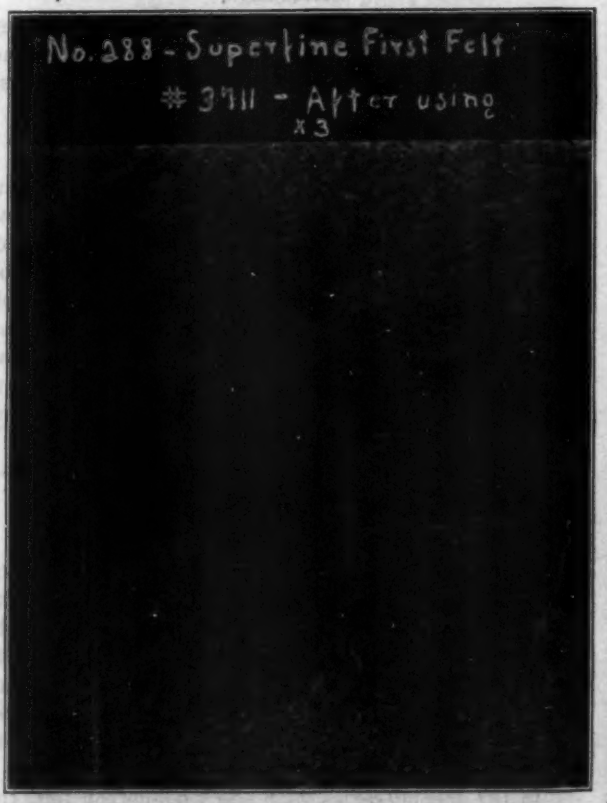
After Suction Boxes. For the same reason as given with samples from Station 2, only two samples were taken each day from the wire after the suction box. The differences from mean on the first run were 0.8% on the third day, and 1.0% on the fifth day. In the second run, the variation was 0.8% on the first and second days, and 9.7% on the fifth.

Run 1—Felt No. 1139 All wool.	Run 2—Felt No. 3711 Cotton-wool.
16.4	16.9
16.5	16.9
16.1	17.4
17.5	17.5
17.9	18.4
Mean 16.9	17.7

STATION NO. 4

Couch. The averages at the couch are in very close agreement from day to day. The variation





Above—Comparison of Wool and Mixed Felts Before Running, Showing Only Small Difference in Surface Conditions
Below—Comparison of Wool and Mixed Felts After Running; Black Spots Indicating the Filler and Fibres

from mean was 0.56% on the fourth, and 1.00% on the fifth day. In the second run, the variation was 1.37% on the first day, and 1.40% on the fifth.

Run 1—Felt No. 1139 All wool.	Run 2—Felt No. 3711 Cotton-wool.
21.19	20.63
21.21	22.16
21.30	21.92
20.82	21.87
22.38	23.40
Mean 21.38	22.00

STATION NO. 5

First Press. As the efficiency of the felt was largely to be measured by the water couched at the first press, all attempts to keep conditions as nearly uniform from day to day, so far as set of the machine was concerned, were made. The principal point of difference noted is the average for the fourth day in the first run, that is on the all wool felt. It is possible that the weights were set a short distance farther back than usual on that day, thus permitting a sheet to pass to the second press somewhat higher in moisture than that on preceding, or following day. The difference here noted follows thru the second press and dryers, but does not appear before this point, so that there can be no other explanation of it. The difference, however, is comparatively so small that its effect on the general average is nil.

Run 1—Felt No. 1139 All wool.	Run 2—Felt No. 3711 Cotton-wool.
37.81	36.70
39.60	41.16
40.83	40.54
38.00	41.99
41.79	42.62
Mean 39.61	40.00

STATION NO. 6

Second Press. The averages at the second press are in close accord with those at the first press. The point for the fourth day in the first series is low, just as it was at the first press. The percentage and averages are:

Run 1—Felt 1139 All wool.	Run 2—Felt 3711 Cotton-wool.
39.08	37.84
41.83	42.61
42.94	42.42
38.54	43.27
42.56	43.43
Mean 40.99	41.91

STATION NO. 7

Dryers. At this station, samples were taken every half hour for thickness of the sheet, both front and back. During the entire run of ten days, the thickness was kept within a limit of plus or minus one thousandth from the mean. The variation from front to back of the sheet, during the run, was practically nil, the width of the sheet being only 17".

Samples were taken here also to control weight of the sheet. By weighing every half hour, the variation from mean in the runs was kept at 0.8% in the first run, and at 1.0% in the second run. The moisture determinations on hourly samples averaged by days give the following results:

Run 1—Felt 1139 All wool.	Run 2—Felt 3711 Cotton-wool.
93.12	91.43
95.59	96.03
96.73	95.75
91.00	96.93
96.17	96.21
94.52	95.27

Conclusions

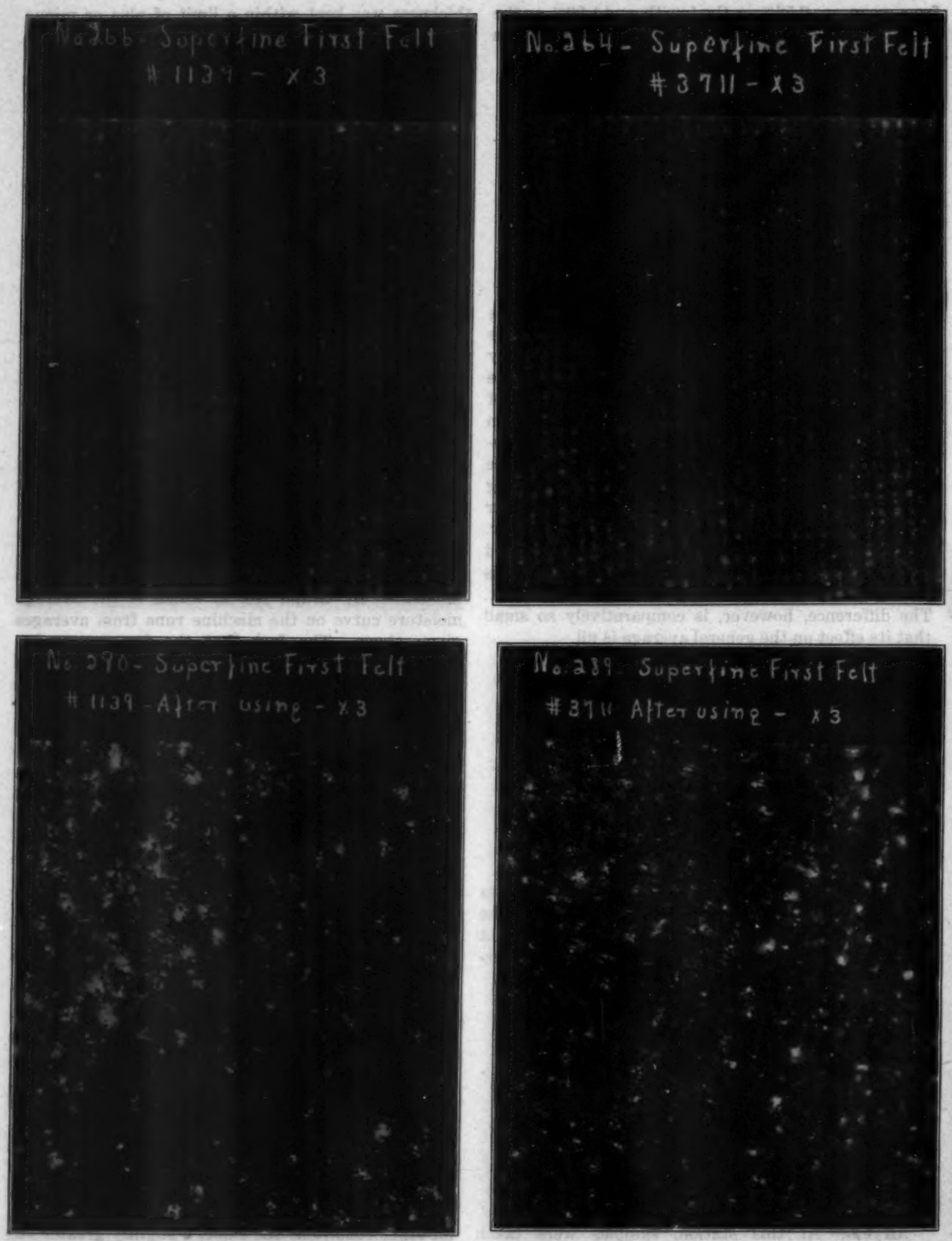
The general conclusions from the data obtained during the run at the different test stations and graphically compared in Graph No. 1, indicates that the two runs were controlled with sufficient nicety, so that the action of the stock on the felt in both cases may be directly comparable. This same fact is also illustrated by Graph No. 2, which is the average moisture curve on the machine runs from averages given above. The fact that the two curves are almost superimposed one on the other, demonstrates that the machine conditions during the two runs were practically identical.

The regularity of the curves in Graph No. 2 from couch to dryers indicates that there had been no appreciable difference in the couching efficiency of the two felts; because if this had been so, then, one of the curves would of necessity have shown a considerable variance from the other.

The comparative regularity of the curves at the first press, Graph No. 1 (with the exception of the fourth day on 1139, which is an out point), also shows that there is no measurable difference in the couching properties of the two felts.

Data on Felt Efficiency

In the table on summaries on data, will be found the tabulation of total volume of water couched out from first press during the runs. This table shows that there was a total volume of 1546.7 liters couched thru the wool felt, as against 1466.78 liters thru the cotton-wool felt. In another way, the per minute average of flowage thru the wool felt is 810 cc, as against 755 cc for the mixed felt. This in itself would tend to indicate that the wool felt was slightly preferable, since under the same pressure, and with all other conditions the same, a slightly greater volume of water per minute was couched thru (Graph No. 3). In the case of the wool felt, it is seen that


No. 266 - Superfine First Felt
#1139 - x 3
No. 264 - Superfine First Felt
#3711 - x 3
No. 290 - Superfine First Felt
#1139 - After using - x 3
No. 289 Superfine First Felt
#3711 After using - x 3

Above—Comparison of Wool and Mixed Felts Before Running, Showing no Apparent Difference in Weave
Below—Comparison of Wool and Mixed Felts After Running; the Light, Indicated by White Spots, Showing Relative Openness

the average per minute flow increased for the first three days, and then starts to decrease regularly by small increments. The general conclusion that may be obtained from that is that the felt has just commenced to plug with filler and fiber. It is evident, however, that this condition has not advanced very far, since the rate of flowage has not materially decreased. When the per minute flow in the case of the cotton-wool felt is examined with the same idea in mind, it presents no such regularity. The per minute flow falls off considerably from that of the first day, but thereafter fluctuates up and down within limits. The curve (see Graph No. 3) approaches a second maximum on the fourth day, and again falls off. It would, therefore, seem that the only conclusion to be drawn from the series was that under the same machine conditions the admixture of 10% cotton in a wool felt tends to decrease the couching rate at the press. This could in operations be overcome by the application of greater weight to the press, but the total result would be to decrease the life of the felt. It should, however, be noted that while the volume couched out with the mixed felt is always smaller than that with the all wool felt, the percentage of difference is only 6.8%, which represents a very small factor.

Data on Press Water

Careful data on the press water was taken to ascertain what changes in composition and in per cent of solids occurred during the run. It was assumed that there might be some relationship between the per cent solids in the white water, and the plugging effect. Apparently, this was not the case, since the percentage of total solids increased slightly during both runs. The solids were also analyzed for relative amounts of filler, and fiber. In this case, as in that of the total solids, there was no relationship from which a general conclusion could be drawn.

Data on White Water

The difference between the composition of the white water from day to day was so small that they were negligible. One fact of interest was noted in connection with the white water analysis. The concentration of solids each day started at a low value, and built up to a maximum, and thereafter remained constant. The length of time taken for the flow of filler into the white water to balance the return of filler by white water, or for equilibrium to be established, was approximately two and one-half hours, although there was no marked change after the second hour.

Production

The production is tabulated under five headings: pounds 8 x 10½, which is the size into which the finished paper was cut after made; pounds trim, representing loss in cutting; dry broke, representing broke actually made on the machine; and wet broke, which is the broke from the wet end, converted to dry basis; the total weight, and the percentage of recovery. These values are so close one to the other that there can be no conclusion as to the merits of the felts drawn therefrom..

The last tabulation is the result of seven daily complete analysis of samples from the machine, to control conditions and keep the stock as uniform as possible. The principal difficulty in the run was to keep the percentage of ash uniform. This was because there was of necessity some variation in the composition of the raw material (paper trimmings), and that the filler added was the amount called for by composite test on the whole lot. Samples of paper taken at different times from the bales showed a difference of from 7.55 to 14.5% total ash. With these variables in the delivery, it was not possible to maintain absolute uniformity. It should, however, be noted that to all intents and purposes the stock could be considered uniform, since the above ash values represent the extreme rather than the average condition.

Photographic Examination of Felts

Six photographs were taken of each felt, three before, and three after the run. The object of the photographs was to permanently record all differences that developed, (a) in the same felt before and after the run; (b) between the wool felt and the wool-cotton felt.

All photographs showing comparable conditions were taken under the same conditions of light, exposure, etc.; that is, all the camera variables were controlled. In printing, care was exercised to observe the same conditions of control, so that the finished print would be a true record for purposes of comparison.

Analysis of Photographs

1 and 2. These are photographs of the surfaces of the two felts (1139 wool, and 3711 90% wool and 10% cotton) before the run. From the photographs, no difference in the felts can be noted.

3 and 4. Photographs of the surfaces of the two felts are here shown after the run. The surface of the wool felt appears smoother than the surface of the cotton-wool felt. This condition is assumed to be the result of a difference in the distribution of fiber and filler on and in the felts themselves. From data on gain in weight during the run, is was found that the wool felt had gained 15% against 12.3% for the mixed felt. This trifling difference in itself might account for the slight difference in appearance, but it was also assumed that in the case of the wool felt the major portion of fiber and filler had been retained in the nap. In the case of the wool-cotton felt, the assumption was that the filler and fiber had been

retained in the weave. More detailed information on this point is obtained from photographs Nos. 289 and 290.

NUMBERS 267 AND 265. These are microphotographs, under reflected light, of wool felt 1139, and wool-cotton felt 3711. The magnification is three diameters, and affords an opportunity to study in detail the surface conditions of the two felts before the run. The photographs demonstrate that there exists only the slightest difference before the run.

NUMBERS 291 AND 288. The surfaces are here shown of the two felts after the run under exactly the same conditions of magnification, light, etc. The filler and fibers were dyed red in order to render them more color-blind to the photographic plate (that they might register black), and afford greater contrast. In 291, it is noted that the nap does not record sharply, that it is matted down, and that the appearance of black spots below it (in the weave) is irregular. In the case of the wool-cotton felt (No. 288), the nap fibers are sharply outlined, and, therefore, lie more nearly in the same place as in the case of the wool felt.

NUMBERS 264 AND 266. These are microphotographs, times three diameters, using transmitted light to detail structure of the felts. There is no apparent difference in the weave of the two felts.

NUMBERS 289 AND 290. Photomicrographs after the run under exactly the same conditions as in 264 and 266. The amount of light, indicated by white spots, gives an idea of the relative openness of the felts after the run, and, therefore, a measure of the degree of plugging. It will be noted that there is somewhat more light transmitted thru the wool felt (No. 290) than thru the cotton-wool felt (No. 289). This fact, taken in connection with the fact that the wool felt retained 15% of its weight in fiber and filler against 12.3% in the mixed felt, may strengthen the conclusion that the greater portion of the retention in the wool felt is in the nap.

Conclusions

From a general review of all the photographic evidence, it is clear that the only difference recorded between the two felts are minor ones, indicating that the addition of 10% of cotton to a felt does not materially alter its structure or properties.

The admixture of 10% of cotton in a first press felt does not materially alter its efficiency. This conclusion was based on the following observations:

None of the operators handling the felts, either before, during, or after the test were able to state which was the wool felt, and which the mixed felt.

There were no marked differences in the operation of the machine.

It was generally concluded, however, that a little more steam was required to dry the sheet from the second felt (cotton-wool) than from the first. This quantity of steam, however, was very small.

The cotton wool felt is somewhat inferior in couching properties to the wool felt. An average of 6.8 per cent less water was removed by the cotton-wool felt.

The test was not run sufficiently long to prove which of the felts would plug first. From photographic evidence, however, it appears that there were less openings thru the cotton-wool felt than thru the all-wool felt.

This is balanced, on the other hand, by the fact that the wool felt gained 15.0 per cent in weight as against 12.6 per cent for the cotton-wool felt.

From the above, it is recommended that a test of properties be made on a full-sized machine under mill conditions.

Finishing Room Management

By HALVER OLSON

HAVING been asked to give a few points on the management of a finishing room, I shall endeavor to do so, though I doubt my being able to give much light on the subject of Standardization and Systemization.

The mill I am with has two machines, manufacturing specialties; chiefly, light weight catalog papers; onion skin; French folios; and waxing paper; but, also, some heavier grades of paper, such as manila, writings and book; requiring the most varied methods of finishing. Being called upon to take care of paper, M. F. and S. & C., trimmed and untrimmed, sealed and unsealed, put up folded, framed, in strawboard and cases, domestic and export, or in rolls, as it comes from the machines, and is required by the customers, the system necessarily has to be elastic and uncertain.

To illustrate: At times we have to run three ream cutters and three crews of sealers, while at other times two or one only, or not any are required. What I have found to be most essential in running a finishing room of this kind, is to use my head, so as to have the work laid out as far in advance as possible, and secure steady and dependable help.

In regard to lay boys on cutters, if properly attended to, I have found them to be great time and labor savers on larger orders and where the paper is hand sorted. The counting and finishing of the paper laid off by them, however, I have found a considerably slower process, owing to the sorting out of wrinkles, pasters and other imperfect sheets, that has to be done by the counter and finisher. Where paper is laid off by girls, this work is done by them.

Automatic counters, now used to some extent on cutters, are not practical on lay boys; but on some grades of paper they will be found helpful on cutters cared for by girls, although it makes their output less.

Another valuable factor that has been added to a

(*Continued on page* 1170)

The Nigger in the Coal Pile

By ROBERT JUNE, M. E.

This is the first in a series of articles by Mr. June on Power Plant Management. Succeeding articles deal with coal and its selection, combustion of coal, influence of furnace design, various types of stokers, bonus system for firemen, abuse of steam, etc. Later articles sum up the best current practice in the business management of the power plant.—Editor.

THE big industries of the country have made a discovery. They have learned that the profits of today depend very largely upon the economies that can be effected in production, and that the profits of tomorrow will depend entirely upon such economies. The recognition of this fact has come tardily to many, but now that they are "seized with the spirit," they are going after savings in every direction.

This is one reason why Big Business is as big as it is, and why the Big Fellows are absorbing the little ones.

It would not be correct to say, however, that the big industries are uniformly economical in regard to the operation of their power plants. Many of them are extremely wasteful. With every incentive to scrutinize power costs, and to put their power plants on the same efficient basis as other producing departments of their factories, they have failed to exercise businesslike supervision over their boiler rooms.

As a general proposition, the manufacturer has been so busy with sales problems and getting volume of production that he has neglected one of the most important elements of profitable operation. He has wasted 25 per cent of his fuel, largely because he has regarded his boiler room as a place of mystery, the chief function of which was to consume coal in endless quantities.

He has given his fireman an unlimited supply of coal and told him to "go to it," and as long as the fireman has kept steam up, nothing has been said. The fireman, on his part, has considered that he has performed his full duty in keeping the pressure gauge at 150 pounds. It was what he was hired for. Nothing was said, when he was engaged, about the quantity of coal he was to burn to keep the gauge at that mark. Coal, to him, has been a very black mineral requiring a great deal of handling—nothing more. The boss has seen to it that it was delivered to him in quantities he, the fireman, required, and the boss has paid for it—so why should he worry.

The United States Bureau of Mines has been for a number of years engaged in obtaining and disseminating scientific information regarding the mining and consumption of coal, and the results of the work have been of great value to technical engineers.

600,000,000 Tons Mined in One Year

Six hundred million tons of coal was mined in the United States last year. It is predicted that this year's production will likely be still greater. Of this quantity, approximately 37 per cent will be burned in the production of steam in industrial plants, and, of this amount, fully 18 per cent, or 10,000,000 tons, will be required to meet the demands of the paper mills.

I have said that 25 per cent of all coal burned in industrial plants in the past has been wasted.

It Is No Secret

David Moffat Myers knew it when he read his paper, "Preventable Waste of Coal in the United States," at the annual meeting of the American Society of Mechanical Engineers in New York in December, 1917. Joseph W. Hays knew it five years ago when he addressed to power plant operators his remarkable little brochure, "How to Build Up Furnace Efficiency." And scores of our ablest consulting engineers, men of the type of John A. Stevens, who devoted years to the perfection of the American uniform boiler code; Charles Thomas Main, president of the A. S. M. E.; Thomas L. Tomlines, of Syracuse; C. W. E. Clarke, of Stone and Webster; Frank R. Ford, of Ford, Bacon & Davis; E. J. Buegler, of Westinghouse, Church, Kerr Company; A. W. Nisbet, of the General Electric Company, and Charles S. Turner, of the Ford Motor Company, know it and have known it for years.

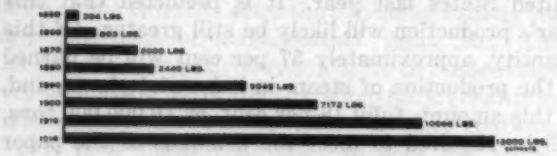
Each of these men has been successful in building up the operating efficiencies of the plants with which he has been associated and knows what can be accomplished. Each knows that the results attained in his plant could be attained in hundreds of others. It is one of the outstanding wonders in the history of the development of industry in America that a waste running into hundreds of millions of dollars should have been permitted carelessly to continue year after year through failure of the business executive to heed the recommendations of his consulting engineer.

The Preventable Waste of Fuel

The preventable waste of fuel in the boiler furnaces of one paper mill recently investigated amounted to 3,000 tons per year, which, at $5 a ton, would cost $15,000. This was a comparatively modern plant. The efficiency of boilers and furnaces in a fourteen-day test was 55 per cent. The load factor was

unusually favorable to high efficiency and could easily be raised to 70 per cent or over. This is only one example, and there are many more extreme cases. In one hand-fired plant, the evaporation was raised from six to nine pounds of water per pound of coal in a few days of instruction, and continuously kept close to this higher mark with the help of coal and water measurements which were inaugurated. The saving was due exclusively to instruction and consequent better operation.

On the other hand, a large industrial concern,



COAL PRODUCTION PER CAPITA OF POPULATION

Why the Cost of Coal Is Inevitably Rising.

internationally famous, operates several good-sized plants that burn as high as 50,000 tons of coal per year. An elaborate bookkeeping system is in use, and petty expenses are kept down to a minimum, and the same policy is carried out in regard to the wages paid engineers and firemen. Although the cost of manufactured production is down to scientific perfection, but little attention is paid to the cost of the steam generated. The engineers are kept busy outside the boiler rooms. The master mechanic for the concern has a "test" made once in a while, and if the evaporation does not come up to expectations, the fault is laid to adverse running conditions and let go at that. A general increase of at least two pounds of evaporation per pound of coal could probably be effected in the plants of this concern, which would mean at least $25,000 saved every year—many times what it would cost to equip the different plants with necessary apparatus and pay the salary of a competent combustion engineer to look after their operation.

In a small South Atlantic town, there are two mills manufacturing the same class of product. The smaller of the two plants burns eighteen tons of coal per day, the larger five.

In another city, there are two textile plants of approximately the same capacity. One burns three tons of coal per hour, and the other ten tons. The proprietor of the three-ton plant is getting rich and buying more plants. Some day he will buy the ten-ton plant and put it on a three-ton basis.

Increasing Dividends Through Fuel Saving

In New England, the management of a large plant, facing sharp competition, came to a realization of the fact that every dollar in the coal pile has to be skinned from the dividend pile and began to take thought of its boiler room. Such things have happened before, but in this instance the thought was followed by action. The furnaces were placed in proper condition, provision was made for regular cleaning and close supervision, and the firemen were placed on a bonus system. Less than $4,000 was expended in making the change. Coal had cost this company $164,000 the preceding year. In spite of the increased coal prices and increased production, the saving effected the first year amounted to $46,000 in real money, and the company declared its first 10 per cent dividend.

There is the case of a certain paper company. By redesigning the furnaces in this plant and adapting them to the fuel used, and by substituting machine-fired grates, the consulting engineers succeeded in obtaining the same amount of steam with but 64 per cent of the coal formerly used. This plant, when completed, was turned back to the same management that it had before with no further instructions. There were installed facilities for continually determining the weight of the coal, ash and water used, as well as the analysis of the furnace gases.

In another large paper plant, a similar saving in coal was effected. This plant has an aggregate capacity of over 7,000 nominal horsepower, divided into

There is no waste of coal in this plant. Every factor affecting economical operation is properly cared for. At the moment when this picture was taken there was not a man in sight, yet the boilers were under full load. Largest boilers in the world, plant of the Ford Motor Company, Detroit.

twenty-two units. It was formerly operated with hand-fired shaking grates, for which the machine-firing grates were substitutes with properly designed furnaces. The plant is now being operated continuously at 150 per cent rating, and is using no more fuel than it formerly did when being operated at two-thirds of the present output. The boiler room force required to operate this altered plant is less than half

(*Continued on page* 1172)

The Suitability of Cotton Hull Fibre for Pulp and Paper Manufacture

By OTTO KRESS

In Charge, Section of Pulp and Paper, U. S. Forest Products Laboratory, Madison, Wisconsin

IN a recent paper by Otto Kress and S. D. Wells,* were described the results of an investigation made on a semi-commercial laboratory scale covering the pulping and paper making qualities of second cut cotton linters, cotton shavings and hull fibre. The writer was invited by the East St. Louis Cotton Oil Company, National Stock Yards, Illinois, to attend some pulp and paper mill trials to be conducted under their direction, and to report the findings to the Paper Industry. This report covers the data obtained in these trials, as well as in previous pulping trials conducted by representatives of the East St. Louis Cotton Oil Company, and in a pulping trial conducted by the Forest Products Laboratory at another plant.

The fibre, as supplied by the East St. Louis Cotton Oil Company, was obtained in the following manner: The cotton seed as received at the oil mill has approximately 200 pounds of fibre adhering per ton of seed. The seed was first cleaned to remove dirt, after which a seventy-five-pound linter cut was made. The partially delinted seed was cut and a separation made of the hulls and kernels, the kernels after a suitable steaming treatment being pressed for removal of the cotton seed oil, and the press cake used for cattle feed. The hulls were treated in a steel attrition mill for removal of the fibre, and by proper screening the fibre and hull bran were separated.

The East St. Louis Cotton Oil Company had secured permission from the Penobscot Chemical Fiber Company, Great Works, Maine, whereby they were permitted to carry on pulping trials in their digesters. Previous to the arrival of the writer at the latter plant, three cooks had been made.

These cooks were made in a welded upright stationary digester 8 ft. by 30 ft., fitted with a false bottom perforated with ⅜ inch holes. Steam admitted through a 3-inch line under the false bottom into an injector or circulator circulates the cooking liquor to the top of the digester, where by means of a special spray the liquor is spread uniformly over the top of the digester charge. When the digester is at pressure, circulation by means of the injector practically stops. In the cotton-fibre cooks, further circulation was obtained by means of a direct-acting duplex steam pump. The digester was operated in the usual manner, being frequently relieved of air and gas. The digester was equipped with a recording temperature gauge, and temperature rather than pressure was used to control the cook.

The cooks made previous to the arrival of the writer were made under the following conditions:

Cook No. 1

Weight of air dry fibre	—7800 lbs. (26 bales).
Caustic soda	—1680 lbs. or 21.6 per cent of weight of air dry fibre.
Volume of liquor	—6800 gals. of 3 per cent NaOH.
Liquor ratio	—7 to 1.
Average temperature	—311° F.
Average pressure	—80 lbs.
Time coming up to temperature	—4½ hrs.
Time at pressure	—3 hrs.

The digester was charged by putting in first fibre, then liquor. Practically no circulation was obtained during the preliminary part of the cook, a fact which was noted by the lag in temperature. At the end of four hours the full line pressure of 110 lbs. was turned into the digester, circulation was secured, and the temperature started to rise. At 300° F. the plunger pump was used to secure circulation, as only sufficient steam is used at that period of the cook to counteract heat losses by radiation. This cook, like the other three made at this plant, was blown into a separator and then dropped to a wash pan, where it was drained. Afterwards it was washed three hours with weak black liquor, and three hours with hot water. The cook did not blow clean; approximately one-eighth of the pulp remained on the digester, and requiring a reblow.

An attempt was made to handle this pulp through the mill in the following manner: The washed pulp was hosed into a chest, and pumped to an inclined knotter screen with a drag conveyor. The screen was perforated with ½-inch holes, and by increasing the water above the amount used in handling soda pulp, no difficulty was experienced in screening. The stock was then pumped to a rotary Quiller screen provided with .065-inch circular perforations. The stock plugged the screen, so that it was finally bypassed to a pulp thickener, where again, because of the freeness and tendency of the stock to collect in a bunch or wad form, it was found impossible to form a continuous sheet. The stock was next put over a thickener, where similar difficulties were encountered, and finally dropped into a bleach-tub, where it was treated at approximately 120° F. with 5 per cent of the bleach, producing a pulp of very high color. From the bleach tank, the stock went to the drainer, and after twenty-four hours it was flushed to a chest,

*"*The Suitability of Second Cut Cotton Linters, Cotton Shavings, and Hull Fibre for Paper Manufacture,"* by Otto Kress and Sidney D. Wells, *Paper Industry, July, 1919.*

put over a pulp thickener, and pumped to a 10-cut diaphragm screen which had to be by-passed on account of difficulty in screening. The stock was finally put over a pulp drying machine and taken off in the form of crepe. The stock which originally was clean had by this treatment become so dirty that it was rejected. The foregoing description of the handling of the stock is given to illustrate the difficulties incident to handling this free, long-fibred, bunchy stock in the usual soda pulp mill manner. By changing the procedure as described in the latter part of this report, the writer believes that all these difficulties may be overcome.

Cook No. 2

So much difficulty was experienced in cook No. 1 in obtaining good circulation that it was decided to introduce steam directly at the bottom of the digester, instead of through the injector inside the digester. The injector pipe was, therefore, plugged at the top with a wooden plug, which was bolted and braced in place. While the digester was being filled with fibre, cooking liquor was run in.

Weight of air dry fibre	— 9900 lbs. (33 bales).
Caustic soda	— 1900 lbs. or 19.2 per cent of weight of air dry fibre.
Volume of liquor	— 6500 gals. of 3½ per cent NaOH.
Liquor ratio	— 4.5 to 1.
Average temperature	— 324° F.
Average pressure	— 85 lbs.
Time coming up to pressure	— 1½ hrs.
Time at pressure	— 4½ hrs.

The temperature rose immediately from the start of the cook, and no auxiliary circulation was used. The pulp when blown was very raw; many of the hull particles were not even softened. The digester did not blow clean, about 20 per cent remaining, on which a reblow was made. In this reblow black liquor was introduced in the usual manner, and on examining the digester after the reblow it was found that the plug had blown out of the circulating line; consequently, for part of the time on the reblow there must have been active circulation. The reblown stock from cook No. 2 was clean and well cooked, and was subsequently made into paper, the pulp requiring 7 per cent of 35 per cent available bleaching powder to bring it to a good color.

The raw cook, representing approximately 80 per cent of the digester content, and estimated at 2,000 lbs. B. D. pulp, was recooked with 400 lbs. of caustic soda, sufficient black liquor (liquor ratio approximately 7 to 1) to cover, for three hours at 320° F., 105 lbs. pressure, without circulation. The digester blew clean, but apparently no further pulping had occurred.

Cook No. 3

In this cook the general conditions of cook No. 1 were repeated. The digester was first filled with liquor, then the fibre was added, and, by means of the pump, the liquor was circulated for 4 hours thoroughly to soak the fibre. In this respect cook No. 3 differed from cook No. 1, where there was no circulation during the filling period, or at any time prior to the actual turning of steam into the digester.

Weight of air dry fibre	— 7800 lbs. (26 bales).
Caustic soda	— 1900 lbs. or 24.3 per cent of weight of air dry fibre.
Volume of liquor	— 6800 gals. of 3¼ per cent NaOH.
Liquor ratio	— 7 to 1.
Average temperature	— 311.5° F.
Average pressure	— 80 lbs.
Time coming up to pressure	— 4½ hrs.
Time at pressure	— 3¾ hrs.

When the digester reached temperature the auxiliary circulating pump was used to secure circulation. One reblow of 10 per cent digester content had to be made. The pulp from cook No. 3 was completely cooked, and after washing was dug out of the wash pan, placed in barrels, and shipped to the Eastern Manufacturing Company, Bangor, Maine, for conversion into paper.

Cook No. 4

Cooks Nos. 1, 2 and 3 were made at a previous time by representatives of the East St. Louis Cotton Oil Company, the data being supplied to the writer (who, however, was present while the fourth and last cook was made).

Weight of air dry fibre	— 7800 lbs. (26 bales). Fibre 89.1 per cent bone dry.
Weight of bone dry fibre	— 6950 lbs.
Caustic soda	— 1500 lbs. or 21.6 per cent of weight of bone dry fibre.
Concentration	— .25 lbs. per gal., or 29.4 grams per liter.
Volume of liquor	— 6100 gals., or 88 gals. per 100 lbs. bone dry fibre.
Liquor ratio	— 7.35 to 1.
Average temperature	— 318° F.
Average pressure	— 87 lbs.
Time coming up to temperature	— 4 hrs.
Time at maximum temperature	4½ hrs.

The necessary volume of cooking liquor was run into the digester, and the fibre which had been shipped in burlap-wrapped bales was added; during this operation the liquor was circulated by means of the pump. When the digester was filled with the fibre no liquor was visible. Steam was turned on at 2 p. m. and the pressure relieved at frequent intervals until the gas and air were removed. At 5 p. m. a temperature of 294° F. was reached, and circulation was started by means of the duplex-plunger steam pump. At 10 p. m. the packing on the pump had become badly attacked by the hot alkali, and leaked so much that it was necessary to stop the pump. At 10:25 p. m. the digester pressure of 100 lbs. was relieved to 80 lbs., and the cook was then blown. The cook did not blow clean; about 20 per cent of the digester content remained, requiring two reblows. The reblown stock was dropped into a separate tank and held over, without draining or washing, from Sunday morning till late Sunday night, a period of 14 hours. The main cook obtained from the first blow was well pulped, showing no uncooked hull particles, and was drained and washed at once. This

pulp, as well as the reblown pulp, was dug out of the wash pan, packed into wooden boxes, and shipped to the American Writing Paper Company, Holyoke, Mass., where it was bleached and made into paper.

A sample of the black liquor obtained from the discharge spout of the blow pit had a specific gravity of 125° Tw., a concentration of 9.76 grams per liter of caustic soda, and an efficiency of chemical consumption of 74.2 per cent.

Cooks Nos. 5 and 6

These cooks were made by the representatives of the East St. Louis Cotton Oil Company in a rag boiler of the Eastern Manufacturing Company, Bangor, Me., and the data were given to the writer by the representative who witnessed these trials. The cooks were made in a 25 ft. x 7 ft. rotary rag boiler, ordinarily rated as a 10,000 lb. rag boiler.

Weight of air dry fibre	— 3900 lbs. Cook No. 5 (13 bales)	— 5100 lbs. Cook No. 6 (17 bales).
Caustic soda	— 640 lbs., or 16.4 per cent of weight of air dry fibre	— 1050 lbs., or 20.6 per cent of wght. of air dry fibre.
Strength of caustic soda solution	— 4 per cent	— 3 per cent.
Volume of cooking liquor	— 2000 gals.	— 4300 gals.
Liquor ratio	— 4 to 1	— 7 to 1.
Total time of cook	— 12 hrs.	— 14 hrs.
Maximum pressure	— 45lbs.	— 45 lbs.
Bleaching powder— (35 per cent available chlorine)	— 10 per cent.	— 10 per cent.

The cooked stock contained a considerable proportion of hulls, indicating clearly that, even with the excess of caustic soda employed, the pressure, and therefore, the temperature was insufficient to completely pulp the stock. The stock bleached to a fair color, but contained a considerable amount of yellowish hull particles which appeared in the sheet when the pulp was converted into paper at the plant of the Eastern Manufacturing Company. Inasmuch as 50 lbs. pressure was the maximum allowable pressure, no further trials were made in the rag boilers of the Eastern Manufacturing Company.

Cook No. 7

This cook was made by Mr. Wells and the writer previous to the six cooks described, on cotton hull fibre supplied by Mr. T. L. Smith, Birmingham, Ala., at the plant of the B. D. Rising Paper Company, Housatonic, Mass.

In this trial a rotary rag boiler with a maximum allowable steam pressure of 45 lbs. was used.

Weight of air dry fibre	— 7899 lbs. (90 per cent B. D.).
Weight of bone dry fibre	— 7100 lbs.
Weight of caustic soda	— 1350 lbs., or 19 per cent of weight of bone dry fibre.
Concentration of caustic soda	— 34 lbs. per gal., or 40.8 grams per liter.
Volume of cooking liquor	— 3950 gals., or 55.7 gals. per 100 lbs. bone dry fibre.
Total time of cook	— 14 hrs.
Maximum pressure	— 45 lbs.

No relief pipe was available to relieve the air from the rotary; consequently, the pressure noted was probably fictitious. Furthermore, the recording pressure gauge indicated only 35 lbs. pressure, but the experimenters were informed that the reading of the instrument was uniformly 10 pounds low.

At the end of 14 hours the pressure was blown down, and the digester dumped. The fibre was incompletely pulped, showing practically all of the original hull particles. These, however, were softened to such a degree that they could be bleached to a high white, and would no doubt have been entirely pulped out if a higher steam pressure could have been used.

A sample of the black liquor on analysis showed 58 per cent free caustic soda and a chemical efficiency of 42 per cent.

The pulp was allowed to lie for two days in black liquor on the digester floor, and was then washed for six hours and bleached cold. The method of bleaching was to use about three-quarters of the total bleach required in the first bleaching treatment for a period of one hour, with a little acid to accelerate the action. The stock was then washed and rebleached for one hour, and dropped into a drainer. The writer was not present at the mill during this treatment, but was informed that some 4,300 lbs. of pulp was produced, equivalent of 60.6 per cent of the weight of the original bone dry fibre, requiring 10.9 per cent of bleach to bring it to a high degree of white. A final yield of 3,800 lbs. of bleached hull fibre was obtained.

Paper Trials at Eastern Manufacturing Company, Bangor, Me., on Cotton Hull Fibre Pulp

All the paper making trials on cotton hull fibre pulp at the Eastern Manufacturing Company being made prior to the writer's visit to the mill, the following information was obtained from the report submitted by the mill, and from representatives who witnessed the trials. Samples of the finished papers were submitted to the writer and tested for strength at the Forest Products Laboratory. These paper trials were made on pulp obtained from cook No. 3 and the reblown stock from cook No. 2 which was packed from the drainer into barrels, and the stock shipped to the Eastern Manufacturing Company.

Runs Made on Reblown Stock from Cook No. 2

The stock was bleached with 7 per cent bleaching powder and made into paper on the following furnishes:

	F. O. 1335	F. O. 1336
Hull fibre pulp	200 lbs.	400 lbs.
Sulphite pulp	1050 "	850 "
White shavings	200 "	100 "
Size	16 "	16 "
Alum	25 "	25 "

The writer was informed that all papers from these trials made at the Eastern Manufacturing Company were top-sized with "Hercules" gum, loft-dried, and finished in a manner similar to two of their standard bonds designated in this report as "grade X" and "grade Y" bonds.

The pulp from cook No. 3 was bleached, using 6 per cent of bleach. The half stock was described as "clean, free from hulls, fair color, and of a harsh feel." Paper was made on the furnish ordinarily used in the manufacture of their X and Y bonds, an equivalent weight of hull fibre pulp being used to replace the rag stock made from thirds, and blues, or other rag stock.

Runs were made on the following furnishes:

	"Grade X Bond" Runs Nos. 1533, 1534	"Grade Y Bond" Runs Nos. 1532, 1535
Hull fibre pulp	600 lbs.	200 lbs.
Sulphite pulp	850 "	1050 "
Shavings	100 "	200 "
Size	16 "	16 "
Alum	25 "	25 "

The report of the Eastern Manufacturing Company gave the following description of the beating and jordaning of the stock.

Beating and Jordaning

Two runs of each of the above furnishes were made. These will be designated throughout the rest of this report as runs 1, 2, 3 and 4. Run 1 is "grade Y" bond beaten four and one-half hours with the beater roll set so as to give the stock a light brush. The jordan was set with low gates and a fairly light setting, and the stock was passed through several times. Run 2 was "grade Y" bond beaten six hours with the rolls set hard on the bed plate. The jordan setting was very light and the gates set slightly higher than before. Run 3 was "grade X" bond, beaten five and one-half hours with a light brush, and jordaned with a moderate setting and high gates. Run 4 was "grade X" bond, beaten hard for five and one-half hours, and jordaned with high gates and moderate setting. The slowness tests on these runs were as follows:

	"Grade Y Bond" 1532—Run 1	"Grade Y Bond" 1535—Run 2	"Grade X Bond" 1533—Run 3	"Grade X Bond" 1534—Run 4
Beater slowness	31	43	31	44
Jordan slowness	83	60	65	106

"Grade X Bond" regular beater slow. 90 Jordan slow. 160.
"Grade Y Bond" regular beater slow. 65 Jordan slow. 125.

It will be noticed from the above that the stock was free even in the case of the hard beating, and moderately hard jordaning. This was found to be so on the machine. The fibres were long, as shown by the fact that although the machine was only drawing 990 pounds per hour, the screens were operating at full capacity. The freeness in spite of the hard and long beating is probably due to the fact that the fibres, being solid, do not hydrate as rapidly as do ordinary cotton fibres.

The pulps produced from cooks Nos. 5 and 6 in the rag boiler of the Eastern Manufacturing Company were of a yellowish-white color, the hull particles being incompletely cooked and appearing yellow. The stock was bleached, and two paper runs made. Run No. 1058 was made on a 100 per cent hull fibre furnish, this paper not being top-sized. The paper was of a yellowish tinge showing considerable yellowish hull particles. Run No. 1059 was made on the regular "Grade X" bond furnish. The strength tests shown in Table I were made at approximately 65 per cent humidity at 75° F., and instead of reporting strength data on the folio basis, all strength tests and ream weights were taken on the 24x36x500 basis; the results if desired can readily be converted to the folio basis.

Table I.—Strength Tests on Papers Made at Eastern Manufacturing Company, Bangor, Maine.

Description of Paper	Humidity, per Cent.	Temperature, Degrees Fahr.	Weight per Ream, 24x36/500 Basis.	Bursting Strgth. Points per Lb.	Folds per .0001 In. Thickness.	Average Breaking Length, Meters.	Average Folding Test, Number.
Standard "Grade X Bond"	64	78	46.0	.60	.71	4740	125
Standard "Grade Y Bond"	65	71	45.5	.53	.70	4350	62
Run No. 1533	64	70	43.5	.41	.48	3700	29
Run No. 1534	66	77	48.0	.38	.42	3310	19
Run No. 1532	64	79	47.0	.45	.55	3840	29
Run No. 1535	64	78	47.0	.45	.54	3970	48
Run No. 1335	64	79	52.0	.40	.52	3600	13
Run No. 1336	64	79	48.0	.43	.56	3910	16
Run No. 1058	64	69	36.5	.33	.33	2570	12
Run No. 1059	65	70	38.5	.39	.43	3000	18

Runs Nos. 1533 and 1534 may be compared with the standard "Grade X bond," and runs Nos. 1532 and 1535 with the standard "Grade Y bond." The other papers were all made on their abnormal furnishes, or the stock was handled in a manner so as not to make the runs directly comparable with either the "Grade X" or "Grade Y bond." The strength of all the papers containing hull fibre pulp falls below that of the standard papers. With harder beater treatment the hull fibre stock would probably have shown greater strength, as was shown at trials made at other mills.

Strength tests made at the Eastern Manufacturing Company rated these papers as follows:

Table II

	"Grade Y Bond"	No. 1532	No. 1535	"Grade X Bond"
Bursting strength Points Mullen	29	28.1	29	36
Tearing strength	252	322	296	330
	No. 1533	No. 1534		
Bursting strength Points Mullen	24.8	24.9		
Tearing strength	311	315		

The tests made at the Eastern Manufacturing Company indicate that bonds with the lower percen-

tage of hull fibre in the furnish are practically, insofar as the Mullen tests show, the equivalent of the standard "Y bond," and show a decidedly better tearing resistance. The bond made on the furnish with the large percentage of hull fibre shows a decided decrease in the Mullen test, and only a slight decrease in the tearing test. In these runs, as well as in the paper trials made at the other mills, the cotton fibre pulp was probably not handled in a manner to develop the maximum strength of fibre. In some cases the pulp lay in the black liquor for several days preparatory to washing, and, in all of the trials, the stock was held a long time preparatory to bleaching, so requiring a very drastic bleach treatment to develop a good white color. Furthermore, neither the writer nor the mills were familiar with the paper making characteristics of this stock, so that, in the writer's opinion, the best beater conditions were probably not attained in any of the runs.

Paper Trials on Cotton Hull Fibre Pulp at American Writing Paper Company, Holyoke, Mass.

The pulp from cook No. 4, made at the Penobscot Fibre Company, was dug from the pans, boxed, and shipped to the American Writing Paper Company. A sample of the pulp was sent to the Forest Products Laboratory, where it was found that 9 per cent of bleach was required. This does not represent the true bleach consumption, as considerable saving could have been made if the stock had been bleached directly after washing instead of waiting for from ten days to two weeks. The stock was shipped about 25 per cent bone dry, and determinations indicated a yield of approximately 62 per cent of pulp.

The following fibre measurements, made on the raw and unbleached fibre, are of interest:

Raw Cotton Hull Fibre as Pulped at the Penobscot Chemical Fibre Co.

Average length of fibre	2.51 m.m.
Longest fibre	5.95 "
Shortest fibre	.74 "
Fibre under 2 m.m.	48 per cent
Fibre over 2 m.m.	52 " "
Average length of fibres under 2 m.m.	1.41 m.m.
Average length of fibres over 2 m.m.	3.74 "

22 black specks or parts of hulls to 92 fibres.

Unbleached Cotton Hull Fibre Pulp Produced by Cook No. 4 at the Penobscot Chemical Fibre Co.

Average length of fibre	2.10 m.m.
Longest fibre	3.97 "
Shortest fibre	1.02 "
Fibre under 2 m.m.	44 per cent
Fibre over 2 m.m.	56 " "
Average length of fibres under 2 m.m.	1.46 m.m.
Average length of fibres over 2 m.m.	2.61 "

Although the foregoing data are obtained from only 25 measurements on each of the pulps, it is indicative of the results that would be obtained through the destruction by cooking of the smaller particles of fibre as shown by a slight increase in the percentage of fibres larger than 2 m. m. in the pulped stock. Unfortunately, no sample is available for fibre measurements at the laboratory of the washed and bleached pulp, as the writer believes that these operations would have still further decreased the percentage of fibres less than 2 m. m. long.

The stock was washed in the beater to remove the finely divided fibres obtained from the cooking of the hulls, and bleached on different trials with and without the use of alum, or acid, and with the aid of heat. The bleached stock was dropped into a drainer, and used in the furnish of papers, where it substituted an approximately equivalent weight of thirds, and blue half stock. Samples of finished paper were tested for strength at the Forest Products Laboratory. Much of the information in table 3 was taken from the final report of the co-operating mill, and was verified by the writer during his attendance at the trial. Both the amber flat and special ledger were top-sized with "Hercules" gum, the papers being loft dried, and finished under similar conditions. The No. 1 amber flat, which was the first run made at this mill containing cotton hull fibre, showed considerable fuzz; this was overcome by a harder brush of the stock for the run of special ledger. The color, strength, feel, rattle, etc., were satisfactory. Approximately as much dirt was found in the regular flat and ledger as was present in the papers in which cotton hull fibre was used.

Trial at the Eaton-Dikeman Company, Lee, Mass.

The writer shipped approximately 1000 lbs. of bone dry unbleached cotton hull fibre pulp to the Eaton-Dikeman Company, at Lee, Mass., for conversion into blotting and vulcanized fibre paper.

A 1000 lb. beater was furnished with approximately 500 lbs. of cotton hull fibre stock, and washed with the roll well off the bed plate for four hours. The stock was then bleached for one hour to a light yellowish shade using a little acid to hasten the bleach; it was then washed, and the roll dropped for one hour. The stock was put over the machine, and a sample of the finished paper put through a laboratory vulcanizing test with zinc chloride, the results of the test being entirely satisfactory to the mill. The strength of the sheet was entirely satisfactory, the main characteristics desired in this paper being east of vulcanization and absorbency. This company was running at that time vulcanized fibre made on a mixed furnish containing a high percentage of munition linters, and this paper, due to the dirt in the munition linters, was considerably dirtier than the paper made from cotton hull fibre pulp. Figure I shows the remarkable absorbency of cotton hull fibre paper in comparison with their normal vulcanizing paper. By the ordinary inkdropping test, water being used to save the time required to prepare the standard ink, the cotton hull fibre stock absorbed 1 c. c. water in 58 seconds, while the ordinary vulcanized fibre paper required 600 seconds to absorb the 1 c. c. of water.

TABLE III.—DATA ON PAPERS MADE AT THE AMERICAN WRITING PAPER COMPANY, HOLYOKE, MASS.

Paper	Bulk per ream	Follo Wgt.	Strength ratio	Mullen	Hull fibre	Furnish: Rag	Furnish: Soda	Furnish: Sulphite	Furnish: Humidity	Strength tests made at Forest Products Laboratory: Temperature	Weight per ream	Bursting strength	Points per .0001" thickness	Average breaking length	Average folding test
	Inches	Lbs.		Lbs.	%	%	%	%	%	° F	24x36/500 basis	Points per lb.		Meter	No.
No. 1 Amber flat (Cotton hull fibre)	1 15/16	23.7	.89	21	45	..	5	50	66	76	56	.35	.48	2860	16
No. 1 Amber flat (Regular)	1 15/16	22.8	1.00	22.8	..	50	5	45	66	76	59	.39	.54	3200	31
Special ledger (Cotton hull fibre)	2 50/64	23.7	1.08	25.5	50	..	..	50	65	73	57	.39	.53	3250	14
Special ledger (Regular)	2 24/64	21.7	1.26	27.3	..	55	..	45	64	74	52.5	.44	.61	3670	33

Another run was made at this mill of blotting paper, in which 500 pounds of unbleached cotton hull fibre stock was to be bleached with the object of producing a high white. This was not done, as during the washing and bleaching treatment, the writer was holding the paper machine idle, so that the bleaching was discontinued before a high white was reached. It was attempted to correct for color by the addition of a little red and blue dyestuff, but the resulting shade was a grayish white instead of a high white.

The blotting made from cotton hull fibre pulp was compared with a very high grade all rag blotter, and, as can be seen from Fig. 1, showed far greater absorption of water by a modified Klemm test than the rag blotter. By the ink-dropping test (using water) the cotton fibre blotting completely absorbed 1 c. c. of distilled water in 8 seconds, while the rag blotting stock required 19 seconds. The cotton hull fibre blotting paper was run .024 inch thick, while the competing rag blotter was .033 inch thick. The relative rate of absorption, as shown by a modified Klemm test for both the blotting and vulcanized fibre papers made from cotton hull fibre pulp in comparison with the normal stocks, is shown in table IV.

No difficulty was experienced in handling the stock, and the co-operating mill expressed themselves as completely satisfied.

TABLE IV.—ABSORPTION TEST BY MODIFIED KLEMM METHOD ON BLOTTING AND VULCANIZED FIBRE PAPER MADE AT THE EATON-DIKEMAN COMPANY, LEE, MASS.

Rag Blotter, Seconds	Cotton Hull Fibre Blotter Seconds	Rise in Inches	Normal Cotton Hull Fibre Vulcanising Paper Seconds	Cotton Hull Fibre Vulcanising Paper Seconds	Inches
10.5	3.5	½	44	5.4	½
60	25.5	1	229	44	1
162	71.5	1½	600	121.4	1½
319	142	2	...	245	2
566	242	2½	...	414	2½
...	376	3	...	600	2⅝
...	543	3½	...	...	...

Trials Made at the B. D. Rising Paper Company, Housatonic, Mass.

The pulp made at a previous date by Mr. Wells and the writer was worked up into paper at the mill of the B. D. Rising Paper Company, Housatonic, Mass., in the presence of the writer. This stock had been bleached previously, using 10.9 per cent bleach, and had been in the drainer for several weeks.

A sample of the bleached stock on microscopic examination yielded the following information:

Average length of fibre	2.10 m.m.
Longest fibre	3.97 "
Shortest fibre	1.02 "
Fibres under 2 m.m.	44 per cent.
Fibres over 2 m.m.	56 " "
Average length of fibres under 2 m.m.	1.46 m.m.
Average length of fibres over 2 m.m.	2.61 "

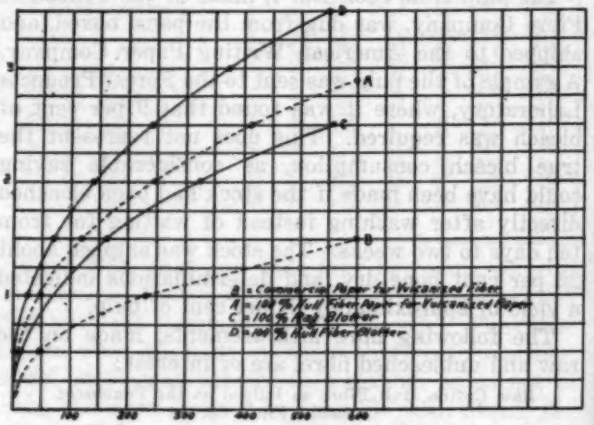

A
C
B
D
A = Commercial Paper for Vulcanized Fiber
B = 100 % Hull Fiber Paper for Vulcanized Paper
C = 100 % Rag Blotter
D = 100 % Hull Fiber Blotter

Figure 1

At these trials three papers were made, a paper to be used in the manufacture of a pasted wedding paper, and two runs of bond made on a furnish of 75 and 50 per cent hull fibre pulp, the balance being bleached sulphite. The papers were animal sized, but not loft-dried. No difficulty was experienced in screening or in passing the paper over the machine. The papers produced were of a high white free from dirt, and of a quality that was satisfactory to the mill.

The strength data on the finished and uncalendered samples are shown in table V.

Conclusions

1. Cotton hull fibre similar to the product manufactured by the East St. Louis Cotton Oil Company can be pulped in the ordinary soda pulp digester. There is no question that less drastic pulping condi-

tions can be used than were employed, and especially must the ratio of liquor to fibre be reduced to insure an economized soda recovery, and considerable further work must be done to determine the optimum pulping conditions. In the one cook witnessed by the writer it was not considered advisable to cut the chemical, liquor volume, or time of cook, as only sufficient raw stock was available for one cook.

2. The ordinary soda pulp equipment for handling the pulp, such as rotary and flat screens, pulp thickeners, etc., are not suitable for handling cotton hull fibre stock direct from the washing pans preparatory to putting the stock over a wet machine, or a pulp dryer. The writer believes that after the stock is washed in diffusers or pans it might be handled as follows: Slush the stock to beaters, and wash while brushing. Cotton hull fibre pulp, if handled correctly, can and must receive a hard brush in the beater to develop its maximum strength, and this could be partially done while washing. The caustic pulping treatment disintegrates the hull particles which are broken down into individual hull fibres, and these small particles probably have but very limited felting and strength giving characteristics, and for certain papers—bonds, for example—where strength is of consideration, must be removed by washing. For book paper or certain other grades, they might be of value as a filler, and could be compared in their paper characteristics to bleached soda pulp. Under the microscope with the Herzberg stain, the cotton fibres show the typical wine red color of rag stock, while the fibres produced from the disintegration of the hull fragments are stained blue similar to chemical wood pulps. The presence of the disintegrated hull particles, if not properly removed by washing, would probably have a decided influence on the pulp or paper, if it were found to be suitable for the production of viscose, acetyle cellulose, or nitration paper for the production of a lower nitrated cellulose, such as is used in the manufacture of celluloid, cellodion, proxylin, etc.

3. No difficulty was experienced in preparing a clean pulp which bleached to a high degree of white with an economical bleach consumption. Such bleached munition linters as the writer has seen, and which were prepared during the war for the preparation of nitro cellulose, are so dirty that in the writer's opinion they are unsuitable for the production of high grade papers. The raw stock on which these pulping trials were made contained, as far as could be ascertained by observation, practically no foreign dirt, such as cinders, and street dirt. From a visit to the plant of the East St. Louis Cotton Oil Company the preparation of the raw fibre was seen, and some experiments were observed in which the hull fibre was put through the attrition mills for recleaning and further separation of the hull fragments. Naturally, the more hull fragments removed the less drastic is the pulping treatment required, thereby saving chemicals and a percentage of the smaller fibre which would be destroyed by the more drastic cooking. Furthermore, the yield of pulp per unit of raw fibre, or the yield per digester, will be decidedly increased if these hull particles that have to be removed by pulping are separated in a preliminary mechanical treatment. In this connection the use of special dusters may prove of direct value.

TABLE V.—STRENGTH DATA ON PAPERS MADE AT B. D. RISING PAPER COMPANY, HOUSATONIC, MASS.

Description of Papers	Humidity, per Cent	Temperature, Deg. F.	Weight per Ream, 24x36/500 Basis	Bursting Strength, Lbs.	Points per .0001 In. Thickness	Average Breaking Length, Meters	Average Folding Test, Number
Unfinished 100% hull fibre wedding paper	65	80	72	.25	.23	2220	7
Finished 100% hull fibre wedding paper	64	79	71	.26	.33	2200	11
Unfinished bond, 75% hull fibre, 25% sulphite pulp	66	82	48	.24	.22	2290	6
Finished bond, 75% hull fibre, 25% sulphite pulp	65	72	48	.25	.30	2430	8
Unfinished bond, 50% hull fibre, 50% sulphite pulp	66	71	47	.28	.28	3220	7
Finished bond, 50% hull fibre, 50% sulphite pulp	66	71	46	.30	.36	3260	8

4. The strength of the fibre is approximately that of the fibre from thirds, and blues, or other soft rag stock. In the papers made at these trials which the writer witnessed, the cotton hull fibre stock made a paper that was apparently a little weaker than those in the furnish in which thirds and blue rag stock was used; it is believed, however, that with better handling slightly stronger papers could have been made. Only a limited amount of pulp was available, which, because of delay in bleaching, was undoubtedly in certain cases decidedly weakened by the drastic treatment given to produce a good white. Furthermore, the mills were not familiar with the character of the stock, and, because of the apparent shortness of the fibre, hesitated to brush the stock as it should have been handled. As already mentioned, the writer believes that cotton hull fibre, to develop its full strength, requires a stiff brush, and the fibre will successfully withstand such treatment.

5. As far as the general paper making requirements are concerned, cotton hull fibre offered no difficulties. Practically no adjustments were necessary to screen the beaten pulp, or handle it on the machine, and the behavior of the stock, insofar as giving excellent formation and water marking of the sheet is concerned, was entirely satisfactory. The papers dried readily, and had the necessary feel and rattle. No difficulty was noted in regard to sizing; samples of paper from all the runs were examined by the

writer and found to be adequately sized. The first run of the No. 1 amber flat showed considerable fuzz on the calendered sheet, but this was readily overcome in the run on special ledger by giving a harder beater treatment which the stock required.

6. Various grades of commercial paper were prepared at four different paper mills, and, from the results obtained, the writer believes that this stock can be used to replace thirds, and blues, or other soft rag stocks in the manufacture of certain grades of bonds, ledgers, papetries, writing, blotting, vulcanized fibre paper, book, envelope, cover, pasted goods, cover papers, etc. Furthermore, in certain grades of paper, this new stock might be of decided interest in making papers requiring a 100 per cent rag furnish. The fine paper mills are buying rag stock subject to market fluctuations, and are dependent on rag dealers whose industry is not stabilized. If cotton fibre pulp were supplied either in laps, or dry in roll form, the mills could purchase this grade of rag stock on contract subject to specifications for cleanliness, and quality, similar to the purchase of chemical wood pulp. The mills would further be released from the handling of the grades of rags substituted from the sorting room through the bleaching operation, as cotton fibre pulp would be furnished in a bleached condition, ready for the beater. Probably, in order to avoid freight charges on the raw fibre, cotton fibre pulp plants would be erected in the fibre at points where cheap power or coal is available. For northern paper mills, where coal and power are deciding factors, the pulp could be partially brushed in the beater during the washing treatment, so necessitating less power expenditure in the paper mill beater. The length of fibre could, of course, be varied by mixing pulps produced from a lighter cut with the cotton hull fibre pulp. To avoid overcrooking with consequent loss in yield, the writer believes that the different cuts representing different fibre lengths should be pulped separately.

7. There is available from the four to four and one-half million tons of cotton seed produced annually, some 700,000 bales of fibre that could be used for purposes other than those for which this material has been used in the past. At 500 lbs. to the bale, this corresponds to a production of 175,000 tons, equivalent to a little less than 600 tons of raw material per day (on a basis of 300 working days a year). This enormous amount of a possible paper stock has been made available through the installation of special equipment at the oil mills, when the War Department required the fibre for the production of nitro cellulose. Only the paper industry can absorb this annual tonnage, but the oil mills will not cut this fibre, and maintain the necessary plants, unless they can be assured of a market for their product. No estimated cost has been given for the preparation of bleached cotton fibre pulp, as the cost of the raw fibre varies. If a drop in labor and materials should occur, then the cost of producing the pulp would probably drop in proportion to any decrease in the cost and conversion of rag stock. It is, of course, to be remembered that from the experience obtained so far, this cotton pulp does not compete with hard rags, but with soft rags such as the typical thirds and blues. The paper industry should receive this new stock with sympathy, and study the handling of the stock in the beaters and on the machine in order to ascertain the conditions for the development of maximum strength. It would certainly be of direct advantage to the fine paper mills if this new stock is found to be suitable to their needs, so assuring them of a constant supply of bleached cotton fibre to replace raw rags, where the costs fluctuate, and which have to be handled through the mill.

The Length of Wood Fibers

The current supposition that each species of wood has a characteristic fiber length, is not borne out by the many thousand measurements which have been made at the Forest Products Laboratory on wood fibers. These measurements show that a greater difference may be found in one tree than exists between the average fiber lengths of different species.

In one Douglas fir disc, for example, the fibers varied from .8 to 7.65 millimeters (.03 to .3 inches) in length, which is a variation of nearly 7 millimeters. On the other hand, the averages of several thousand measurements on Douglas fir and longleaf pine were less than one millimeter apart, being 4.41 and 3.67 millimeters, respectively.

In the first case, 67 per cent of the fiber measurements in one tree fell between 4.5 and 6.5 millimeters, which roughly indicates the meaning of the common term "average fiber length" for the tree or species.

Such data obviously can be of little value for identification purposes, because of the overlapping of the ranges of fiber length in the various species.

Some relations have been observed between the length of fibers and their position in the tree. During the first 20-50 years of growth, the increase in fiber length from the center of a tree outward in any plane is very striking. An approximate maximum having been attained, fiber length, though it may fluctuate somewhat, does not radically change thereafter, even in trees 400 or more years old. Some increase in fiber length occurs also for about two-thirds of the distance from the butt to the top. Within each annual ring, the length of the fibers varies, particularly in the conifers, where the early springwood has the longest elements, and the last-formed cells of summerwood, the shortest in the ring.

No clearly defined relation has been found between fiber length and the strength of wood. The longer fibers are often found in the weaker material.

How to Determine the Proper Selling Price

By C. OLIVER WELLINGTON

Member of the Firm of Scovell, Wellington & Company, Boston, Mass.

Presented at the Meeting of the Connecticut Valley Branch of the Cost Association on February 9, 1920, at the Hotel Nonotuck, Holyoke, Mass.

The author has had a wide experience in cost accounting for paper and pulp mills and converters of paper, and this article is written in a general way to cover both of these fields.

THERE is a tendency today in business for individual manufacturers to look at matters in a broad way. There was a time, not long ago, when it was the rule not to tell anything. That attitude is disappearing. Manufacturers have found that associations for the exchange of ideas are of considerable advantage; that information given out in this way is a benefit to the industry; and that they individually as a part of the industry are helped, as are all those who co-operate. There is not only an immediate financial advantage, but daily business life and dealings are made more pleasant and satisfactory to the right-handed man who believes in the doctrine of "live and let live."

As a result of our experience in helping a number of national associations to get together, we have seen the direct financial benefits to all the individual companies from getting together, and educating one another.

Elements of Selling Price

No manufacturer knowingly sells goods at a loss, but often goods are sold without realizing a loss is being made, through overlooking some of the factors that enter into the manufacturing cost or selling price. In determining the selling, you must consider the following elements: (a) normal manufacturing cost; (b) administrative expenses, that is, those general items that do not go into manufacturing; (c) selling expenses, such as salaries and commissions; (d) loss from rejections of product shipped to customers and sent back, which must be sold as jobs or seconds; (e) loss from manufacturing capacity not utilized, "unearned burden"; (f) increase in costs of materials, labor and many items of burden; (g) federal income and profit taxes, and (h) after providing for all these items, you should figure a net profit.

You are all familiar with the three elements of manufacturing cost: direct labor, materials and overhead burden. In making an estimate for a selling price, it is customary to figure these elements on a normal basis. You take the normal cost based on present market for materials; take the normal cost for labor based on what you are paying; then take the normal burden, based on the most recent information you have as to what the burden is. Some of the items of burden are often omitted, with the result that you cut greatly into your profit, and in some cases wipe it out entirely. I will not dwell on the methods of determining normal manufacturing costs, but would emphasize the importance of including all items.

Administrative and Selling Expenses

The most important consideration with these expenses is to be sure they are all included. Any items paid out by the business and not included in manufacturing cost or administrative and selling expenses are a direct drain on the profits.

I have been asked how administrative and selling expenses can best be handled in determining a selling price. The most common method, and one which will be satisfactory under normal conditions, is to determine an average percentage of the total of these expenses to the net sales. In some mills, it is important to make an actual or arbitrary division of the administrative and selling expenses to the several classes of product on some basis more accurate than a general average, but the best basis can usually be determined from the facts in each case.

Loss from Rejections by Customers

While under present market conditions, the chances of rejections being made are rather slight, you must bear in mind that the selling price must take into consideration your experience in respect to rejections over a period of several years, as the good years must make up for the bad ones. It is often surprising how much worse the product of a mill appears to some customers when the market is falling. Now is the time to insure against at least part of the loss from future rejections.

Unearned Burden

Unearned burden represents the difference between the normal operating capacity and the capacity actually used by the plant in a particular period. If, for example, 130 hours is the normal running time (after a reasonable allowance for unavoidable losses, such as starting up Monday morning, or repairs) and you only run 117 hours, there is a loss of 13 hours in overhead or burden which does not get into the cost of the orders run in that period, and yet it represents 10 per cent of the burden cost which must be covered somewhere. The only way to cover it is to add

an item to the normal operating cost in good times when you get a fair selling price, which is sufficient to take up the slack in poor times. The only way to average a fair return on the capital invested is to get more than the normal profit in good times to offset the less than normal profit obtained in poor times.

There are other items beside lack of orders which cause unearned burden, such as failure to keep the plant in balance in accordance with the way it was laid out. You may sell paper in rolls in some periods. In other periods, you may finish all your paper in one way or another. Although your mill is filled with orders, you may not use all your equipment, depending upon how the paper is finished. You may find you are making a greater profit on finishing equipment which had previously been used, if the business as a whole is to show a normal profit. The same is true in a mill making various grades of paper which require work of certain departments in varying degrees. The production of an unusual quantity of paper with a high pulp content will require less than the full capacity of the rag room, which will be shut down part of the time.

There are several causes of unearned burden to be considered today, which would not have been thought of three or four years ago. Lack of labor in the paper industry makes it a difficult problem to keep running at a normal basis. The labor secured is not as efficient as it was a few years ago. The failure to deliver materials occasionally holds up the mill.

Now the estimates, as I stated before, should be made on a normal basis to show what can be expected under normal conditions. Allowances for these special items should be added, based on the judgment of the executives of each plant.

Increases in Costs

Fluctuations are likely not only in the unearned burden, but in costs of materials, and supplies, and labor. In figuring the selling price, you must not only take the manufacturing cost as it has been calculated on a normal basis, but must carefully figure the probable prices for materials and labor at the time the goods will be produced. Increases in expenses entering into the burden cost must also be figured.

Federal Income and Profits Taxes

The next item to be considered in determining a fair selling price is the heavy federal taxes that must be paid before there is a real net profit available for stockholders. Theoretically, federal income and particularly profits taxes are supposed to be a division of the profit with the government, but practically they should be considered as a cost of doing business, and the tax passed on to the consumer in the prices of your products. One difficulty is that the amount of these taxes is not definitely determinable until the end of the fiscal year, but a fair estimate can be made based on the business you expect to do. Be sure to make the estimate large enough so your stockholders will get a fair return on the money invested in the business.

Net Profit

After considering all the items mentioned which are in addition to the normal manufacturing cost, there is the important question of the net profit. The basis for figuring profit in the paper industry, as in a good many other industries, has generally been a rate per pound. We have found in many cases mills making a variety of product were figuring to get, say, one-half a cent, one cent or two cents per pound profit. If a certain product was making a profit of so much per pound, they were satisfied; but should they be?

If you want to make a net profit of, say, $70,000 per year, that can be reduced to a profit of $1,400 per week, and can be divided between two machines as $6 per hour and $4 per hour. The only way to determine whether product run on a machine is profitable or not, is to see what profit per hour it will make, as compared with the standard you expect. Onion skin might show a nice profit per pound, but the profit per hour might be much less than that obtained on the same machine with the heavier weight paper.

Figure the fair profit you want hourly on each machine, and see that such product made stands on its own feet and yields the hourly profit.

Importance of Good Accounting

The most important lesson to be learned from a discussion of cost accounting, or a discussion of any kind of accounting or cost figures for manufacturing, is that you should get prompt and dependable information telling what the business is doing. That information should be classified in such a way that you know not only totals, but what various departments are doing, and what the various products are costing.

In addition to the manufacturing cost, other elements must be taken into consideration. The accounts should be so classified on the books that the total of each of these elements is known, and you can tell how much must be added for each. To repeat, the items to be considered in fixing the selling price, beyond the normal manufacturing cost are: administrative and selling expenses; loss from rejections by customers; unearned burden; increases in costs; Federal income and profits taxes; and net profit.

If the accounting is properly laid out and intelligently used in the making of sales prices, you will find that it is a distinct asset of your business. The more information you have, the more correctly you can figure your selling prices, and judge your conditions as compared with others in the industry.

"The man who knows and knows he knows" how to figure his selling prices and profits is a better customer, a better competitor, and a better neighbor.

Colloidal Chemistry as Applied to the Paper Industry

By W. A. DARRAH
Vice-Pres. Continental Industrial Engineers, Inc.

THIS paper is designed to outline the fundamental principles of Colloidal Chemistry and to show their relation to the industry of paper manufacture.

An effort has been made to omit, as far as possible, the highly technical terms covering this science, and to confine the discussion more directly to the practical side. It is not an easy matter to treat a subject of this nature without dealing with some portion of the theoretical principles. In any case, the writer is open to the criticism of the chemist for not being technical, while at the same time the practical man complains of an excess of theory.

This discussion will be divided into two main portions. The first—dealing with the principles of Colloidal Chemistry; the second—Pointing to some of the practical applications of these principles in the paper industry.

Definitions

The questions which naturally arise in the minds of those unfamiliar with this subject are:

What is Colloidal Chemistry?
What are Colloids?
How can you determine when a substance is Colloidal?
What are the properties of Colloids?

In the first place, it may be appropriate to state that Colloidal Chemistry is not strictly a branch of chemistry in the ordinary sense, but deals with the properties of finely divided particles from the physical standpoint.

It has long been known that when substances are very finely divided they acquire new and different properties as a result of their state of sub-division.

The question then arises as to what are the limits of the sizes of particles between where they may be colloids?

These limits will be explained later in this paper. For the present the definition may be given that Colloidal Chemistry deals with the properties of particles in a certain state of sub-division.

Practically any material may be prepared in the colloidal form by merely sub-dividing it. In other words, the term "Colloid" is independent of the composition or chemical properties of a material, but merely indicates the size of the particle.

We find examples of colloids on all sides. The blue color of the sky, the white opaqueness of the clouds, and the muddiness of streams, all result from colloids. Practically all foods are colloids, and all of the chemical reactions connected with animal and vegetable life take place exclusively between colloids.

The cellulose which forms the basis of your paper is a colloid. Your rosin size is a colloid. The alum which precipitates size is a colloid. The most valuable fillers are colloids. Printing ink is a colloidal solution. The parchmentizing process is a colloidal reaction. Lubricating oils owe their value to colloidal constituents. So it is evident that practically every important material in the paper industry is of colloid nature.

From this brief discussion, the importance of understanding and applying the laws and principles of colloidal chemistry will be apparent.

Ignorance of the principles of Colloidal Chemistry may materially depreciate the value of what otherwise would be a high grade product, while conversely, a paper may sometimes be materially increased in value by careful application of the principles of Colloidal Chemistry.

Characteristics of Colloids

In most cases, colloids are encountered in the so-called colloidal solution. A colloidal solution is a mixture of a finely divided substance in a supporting medium.

The substance which is finely divided may be either a solid, a liquid, or a gas, and, in the same way, the supporting medium may also be either a solid, a liquid or a gas. For example, smoke is a colloidal suspension of a solid (largely carbon) in a gas; fog is an example of a colloidal suspension of a liquid (usually water) in gas (air); milk is a colloidal solution of fat in water and is thus an illustration of a colloidal solution of one liquid in another liquid. A colloidal solution of this type is called an "emulsoid," and the product, an "emulsion."

The suspension of mud in water is an example of a colloidal solution of a solid in a liquid. Such a colloidal form is called a "suspensoid."

The blue color of sea water or of large lakes is due to the suspension of the minute colloids in the water.

Most commercial operations which involve colloids are confined to the two types illustrated above; namely, the emulsoids and suspensoids.

One characteristic of colloids is the great difficulty in removing them from suspension by a filter. For example: ordinary commercial filter paper will retain particles having a diameter of five microns or greater

(0.0001 cm). On the other hand, particles of colloidal clay range from one-tenth to one-twentieth of this diameter and may, therefore, readily pass through ordinary filter paper.

Filters are in use which will more or less completely remove solid colloidal materials (suspensoids), but emulsoids or solutions of liquid colloids in other liquids are much more difficult to handle.

Light Test

One means of detecting colloidal materials is the so-called Tyndal effect upon which the ultra-microscope is based. In other words, if a beam of light is passed diagonally through a solution which contains colloids, the path of the beam of light may be traced by a multitude of shining particles. Even though the colloids are entirely invisible with the most powerful microscope, this test invariably detects them.

By means of this test, it is possible to detect the presence of colloids in all water used for industrial purposes. Only carefully distilled water is substantially free from colloids.

Diffusion

Another characteristic peculiar to colloids is the relatively slow rate of diffusion. If a true solution of colored material (such as ink) be added to the corner of a large vessel of water, in a comparatively short time the color will diffuse through the entire vessel; on the other hand, if a colloidal material (as, for example, milk) be added to a small quantity of water under similar conditions, diffusion will be extremely slow, and the boundary line between the water and the milk will be relatively sharp. This characteristic is one which the unscrupulous milk dealer should carefully study.

Colloids may appear perfectly clear and transparent under ordinary conditions, and the appearance of opacity is not essential to a true colloid; for example, glues and gelatine are typical colloid materials, and in some forms they are absolutely transparent.

Theory of Colloids

The theory of Colloidal Chemistry has been gradually developed within the past twenty-five or thirty years. Thomas Graham, the founder of science, proposed certain theories which have served as the basis on which the more modern conceptions have been built.

It would appear that the peculiar properties of a thin film of liquid are fundamentally responsible for most of the peculiar properties which we call colloidal. It is a well known fact that if a steel needle is placed on the surface of a bowl of water, the needle will float. A study of this phenomenon shows that the surface of the water has been depressed and behaves somewhat as if it were a thick viscous material.

A second common characteristic, familiar to all, is found in the behavior of films of liquid, as in the case of soap bubbles. The strength and elasticity of the film of water of a bubble is many thousand times greater than the strength of a similar quantity of water in bulk.

It is also a familiar experiment to support pieces of relatively heavy cardboard upon a layer of bubbles. The question immediately arises: why will a liquid, like water, which is very thin and has no tensile strength, show such a surprising strength in the case of the floating needle and the soap bubble?

The scientific answer is highly mathematical and rather complicated; but fundamentally, it appears that a thin film of liquid is composed of thin layers, probably of opposite electrical charges, whose action upon each other gives the surface of the liquid different characteristics from the body of the liquid.

If we picture the colloidal materials as having each particle surrounded by an extremely thin film of liquid (somewhat resembling a soap bubble), we will have a rough working basis which will help in understanding some of the characteristics of colloids.

It will be obvious that the greater the amount of surface for a given amount of colloid, the more pronounced will be the colloid characteristics.

It is also obvious that the more finely a given amount of substance is divided, the greater amount of surface it will have; for example, a cube of wood one inch on the edge will have 6 sq. in. of surface. If this cube is divided into smaller cubes, each having an edge one-tenth inch long, we will have 1000 cubes, each of which has a surface of 0.06 sq. in. In this case, the total surface will be 60 sq. in., while the volume, as before, will be 1 cubic inch. In other words, by dividing the cube into similar cubes, we have increased the surface in exactly the same ratio as we have divided the volumes. The ratio of volume to surface is called specific surface, and appears to be the determining characteristic of colloids.

The following table will illustrate the effect of subdividing a solid along the lines described above:

Length of One Edge	Total Surface	Specific Surface
1 cm.	6 sq. cm.	6×10^0
1 mm.	60 sq. cm.	6×10^1
0.1 mm.	600 sq. cm.	6×10^2
0.01 mm.	6000 sq. cm.	6×10^3
1.0 micron	6 sq. metres	6×10^4
1.0 micro-micron	6 hectares	6×10^8

The figure of specific surface which, it will be noted from the table given above, is directly proportional to the degree of sub-division, is a measure of the colloid properties. In other words, the term "dispersion" refers to the amount of free surface per unit volume.

Based on this definition, the term "disperse medium" has been applied to the medium in which

the colloid is suspended, while the term "disperse phase" has been applied to the substance which is divided in the colloid form.

It will be evident from the above discussion of the degree of sub-division, that the size of the particle is of fundamental importance. It appears that when the degree of sub-division (dispersion) is too little, the peculiar effect of the surface film around each particle is not sufficiently great to overcome the ordinary properties of the material. On the other hand, if the degree of dispersion is too great; in other words, if the material is too finely divided, the substance is no longer a colloid, but approaches the condition of a true solution. It has been found experimentally that the limits between which colloids ordinarily exist are about 2 one hundred thousandths of an inch and 2 one hundred millionths of an inch.

Figures alone are usually not readily appreciated, and in order to roughly picture the sizes which these values indicate, it may be of interest to state the relative dimensions of some of the ordinary materials which are encountered in every day life.

The diameter of a blood corpuscle is about 7½ times that of the largest colloidal particles. A granule of rice starch has approximately the same diameter as a blood corpuscle. The larger particles of china ball clay are about one-half the length of a blood corpuscle, while the smaller particles of china ball clay fall within the range of colloidal substances.

The diameter of a granule of potato starch is about one millionth of an inch in diameter, or about the mean average diameter of colloidal materials. The cellulose aggregations as a rule are slightly smaller than the larger colloidal particles of china ball clay. A molecule of common salt has a diameter of about one-fortieth millionth of an inch, or one-fourth of the smallest colloidal material. A sugar molecule has a diameter about three times that of a molecule of common salt.

The above discussion will give a rough, relative conception of the sizes between which colloids may exist. It should be understood, of course, that colloids are not limited to any single diameter, but may vary anywhere between the limitations given. Naturally, however, the properties of colloids will vary with the degree of dispersion, and as a rule the smaller the particles, the more active will the colloids be.

Effect of Charges on Colloids

As stated above, colloids usually possess definite electrical charges. The electrical charge is not always the same for the same material, varying in amount and sign. As a rule, the charges are increased by increasing the degree of dispersion. The charges are also dependent upon the medium in which the colloid is suspended.

As might be expected, a positively charged colloid will tend to combine with a negatively charged colloid usually precipitating both from suspension. It may be interesting to point out in this connection that the precipitation of size by alum is one typical instance of the precipitation of a negatively charged colloid by a positively charged colloid.

Both the alum and the size may possess different quantities of charge, and it is possible to prepare alum with a negative charge instead of a positive charge, in which case its action upon a negatively charged size would be much less. This characteristic will account for the varying effectiveness of alum under different conditions.

In a similar way, the particles of rosin size may be either positively or negatively charged, and the excess of rosin carried by the size may also vary in electrical characteristics.

Some Colloidal Properties of Rosin

In this connection, the properties of a solution of rosin and alcohol in water are illustrative of some of the peculiarities resulting from colloidal characteristics. For example, if a quantity of rosin is first dissolved in alcohol and then a small quantity of water is added, a colloidal solution of the liquid rosin-and-alcohol in water results. Since rosin and alcohol form a liquid, the result is an emulsion.

On the other hand, if alcohol and water be first mixed and then rosin be added to the mixture, the result is a suspensoid in which the rosin is distributed throughout the solution independently of the alcohol.

These two colloidal solutions behave in an entirely different manner, require different quantities of precipitants to remove the alum, and respond in an entirely different way to temperature changes. In spite of all of these differences, the chemical analysis of the two solutions would be identical. One marked difference in the behavior of these two materials is their action on cooling. Since the emulsoid of rosin-alcohol in water will solidify as the temperature is lowered, this emulsoid solution will become opaque on cooling and will again become transparent on heating. On the other hand, the suspensoid of rosin in alcohol-water is not solidified by the same degree of cooling, and, therefore, does not become opaque. This difference in the behavior of two solutions which would show substantially the same chemical composition, illustrates the field of colloidal chemistry.

In connection with the electrical charges on material, it is of interest to know that alkalis in general are positively charged, while acids in general are negatively charged.

It is, of course, well known that rosin has the characteristics of an organic acid, and this accounts for the negative charge which it usually carries in colloidal solution. On the other hand, alum also has an acid reaction, thus indicating that in general it would be negatively charged, but the aluminum hydroxide produced by the action of water on alum is positively charged. The positive charges on the aluminum

hydroxide tend to combine with the negative charges on the rosin in solution, thus causing precipitation by the formation of a double particle.

The well-known effect of precipitating rosin from size by the addition of an acid, on the other hand, acts through the neutralization of the alkali by the acid, thus destroying the alkaline solution which is necessary for the existence of the rosin as a colloid.

Characteristics of Films of Colloids

It has been determined by careful experimental work that when a substance is dissolved in a liquid, and the liquid then drawn out into a thin film, there is a concentration of the dissolved substance in the film of the liquid greater than in any other portion. The cause for the concentration of dissolved materials in the film is not clearly understood, but probably results from the formation of electrical charges at the extreme surface of the film.

The result of this concentration of dissolved material, however, is to very materially reduce the surface tension or strength of the liquid film.

Various colloidal materials behave very differently in this respect. Because of the importance of this phenomenon in the applications of colloidal chemistry, a list of a few common substances and their effect on surface tension is given below

SURFACE TENSION OF COLLOIDAL SOLUTIONS AT 20 DEGREES C.

Material	Relative Surface Tension
Water	8.25
Egg Albumin	5.00
Tannic Acid (10% solution)	5.80
Gum Arabic (20% solution)	7.60
Isinglass	6.70
Venetian Soap (0.25% solution)	2.68
Venetian Soap (2.5%)	2.50

The substances of which Venetian soap and tannic acid are typical are excellent examples of the power of increasing the colloidal characteristics of materials which would otherwise be only slightly colloidal. They are therefore called "dispersing agents."

For example, the addition of very small amounts of tannic acid will make clay, which is normally only slightly colloidal, become extremely plastic and colloidal. In a similar way, sodium silicate will increase the plasticity of clays, pulp or similar materials.

The well-known addition of straw in the manufacture of brick is an illustration of the application of this principle practically, without a knowledge of colloidal chemistry. Straw, particularly when somewhat decayed, contains considerable quantities of tannic acid. In a similar way, the decomposition of the cellulose molecule will produce materials which increase the plasticity of the pulp, and therefore explains the greater fluidity of pulp on aging. On the other hand, the presence of an excess of certain chemicals has a tendency to precipitate the colloidal particles by the previously explained mechanism of combining of oppositely charged particles.

This, therefore, accounts for the deterioration of pulp on aging.

The chemical nature of the pulp and contained salts will therefore determine the effect of aging on the material.

Brownian Movement

It has been discovered that in colloids the particles are in continual motion. The motion is partly one of rotation, and partly longitudinal. It is irregular, and up to the present time no satisfactory explanation has been given. The motion is only visible in high-power microscopes. This property of continual motion appears to be characteristic of all colloidals, and probably accounts for the relatively slow rate of diffusion previously discussed.

The activity or rate of movement is, roughly, inversely proportional to the size of the particles, and when the particles exceed the upper limit given for the range of colloids the motion practically stops. It will, of course, be evident that the speed with which colloidal reactions take place will be substantially proportional to their activity, and the characteristic Brownian motion, therefore, allows qualitative study of the speed with which precipitating agents will act, and the quantity of precipitants necessary.

Variables Which Affect Collodial Reactions

Colloidal reactions are more sensitive to surrounding conditions than most of the reactions which occur in other branches of chemistry. Some of the variables which have a marked influence upon colloidal reactions are summarized as follows: Diameter of particles, temperature, charges on particles, age of solution, dilution, order of mixing, presence of electrolites.

From the discussion which has previously been given, the reason that the above variables influence colloidal reactions will be evident. Because of the importance, however, of these variables in the commercial application of colloidal chemistry, a very brief discussion of their mode of action will be given.

DIAMETER OF PARTICLES. As has been pointed out, the speed of Brownian movement is roughly proportional to the size of the particles. Accordingly, colloidal solutions composed of small particles (having a high degree of dispersion) will react much more rapidly than solutions of larger particles. On the other hand, a mixture of two colloidal solutions, one comprising mainly large particles and the other comprising mainly small particles, will often react more rapidly than a mixture of two solutions both of which are either composed of exclusively large particles or exclusively small particles.

Other things being equal, it is usually easier to

precipitate larger particles from solution than smaller particles.

TEMPERATURE. The effect of temperature is usually to increase the degree of dispersion of a colloid, to increase the activity, and, when carried to an extreme high temperature, usually coagulates colloids. Elevated temperatures usually tend to neutralize the charges carried by individual particles, thus acting to precipitate the particles from solution. An increase in temperature also tends to increase the activity of the Brownian movement.

TIME. The function of time in colloidal reactions is usually much more important than in the case of other branches of chemistry. Many colloidal solutions gradually lose their charges when allowed to stand for a sufficient time. This is first evidenced by the gradual increase in the size of the individual particles (or conglomerates), followed by the precipitation of all of the colloid material. The behavior of carbon black in printer's ink is a typical example of this action. When printer's ink is first manufactured, a miscroscopic examination of a small diluted portion will show a relatively large number of truly colloidal particles. After standing for thirty-six hours, however, there is a marked tendency of these fine particles to form groups of much larger size. This action accounts for the aging of printing ink, and causes many of the characteristic properties of this material. In the same way, wood pulp and other cellulose materials are affected by time.

In the case of pulp and many other substances, aging is influenced by the additional chemical reactions which take place on the breaking down of the cellulose molecule. For example, cellulose will frequently form hydrates or other compounds, and the by-products of these reactions will, in turn, cause further chemical changes.

CHARGES. The subject of electrical charges has been discussed at length previously, and it is therefore only necessary to point out that the great majority of colloidal reactions are dependent almost entirely upon the charges carried by the dispersed material.

For example, if a colloid whose particles are negatively charged is mixed with a colloid whose particles are positively charged, the usual result is a combination of the positive with the negative particles, which causes the precipitation of both particles. The practical possibilities of this condition will be pointed out later in connection with some of the applications to the paper industry.

DILUTION. The dilution of a colloidal solution is a measure of the amount of colloidal surface available. It will be evident from the above discussion that if the concentration of a solution becomes so great that the Brownian movement of the particles results in frequent collisions, the tendency will be for the colloidal particles to combine, forming larger aggregates, which, in turn, are likely to precipitate from the solution. It appears that when two colloidal particles are brought into positive contact, the surface film appears to be broken and one larger particle results.

It should be understood that in most colloidal solutions, even in the case of very thick jellies, the colloidal particles are not in actual contact. Some solutions are known in which the particles appear to be very nearly in contact throughout the entire mass of the colloid, but such cases are rare.

Practical Applications of Colloidal Chemistry

To properly appreciate the value of colloidal chemistry, it must be clearly understood that it is not a form of magic or a "cure-all" for the difficulties which are encountered in the paper industry. It is rather a science by means of which the reactions which occur in the paper industry can be predicted when all of the circumstances are known. It also supplies an explanation which accounts for many of the pecularities which have hitherto been noted, but not understood.

The question of size, as applied to paper, has been briefly discussed in the earlier part of this article. The reason for the precipitation of the size by alum has been pointed out, and some of the causes have been outlined, which make for the most economy in manufacturing.

It has been pointed out that the precipitation of size is largely the result of the neutralization of the electrical charges of two groups of oppositely charged colloids. Pursuing this line of reasoning further, it will appear that in place of alum, any other colloid having a similar charge on the individual particle should be applicable. Experiment proves that this is the case, and in a laboratory way many promising substitutes have been found for alum. This is mentioned, mainly, as a matter of interest from the cost standpoint.

The manner of securing the greatest effectiveness from the material used to precipitate the size seems to be largely a matter of producing an active colloid having the maximum charge on each particle. There are various chemical methods of increasing the charge carried by a given colloid.

The different results which may be obtained by the order in which the materials used in sizing are mixed is well explained by colloidal chemistry. For example, if the size is added to the pulp, and after thoroughly mixing these two materials the precipitant is added, it will be evident that an opportunity has been afforded for the colloids of the size to combine with the colloids of the pulp. The degree of combination will, of course, depend upon the relative amount and sign of charges on the two colloids. If both colloids (that is, the rosin and the pulp) have charges of like sign, little reaction will be caused other than that due to purely chemical causes.

On the other hand, if the rosin and the precipitant

(*Continued on page* 1168)

Fire Causes and Prevention

Prepared by the Engineering Department of the National Safety Council

THE loss caused by fire in the United States has been increasing steadily in recent years, and is now estimated to have reached the enormous total of $300,000,000.00. The property loss every year is approximately three times the annual production of gold and silver. At least two-thirds of this property loss and of the attendant loss of life is preventable.

The prevention of fire depends upon the elimination of conditions which are likely to cause fire. Only common fire causes—those likely to be met with in any manufacturing plant will be dealt with, and these will be considered under the following main divisions:

(a) Power Generation; (b) Power Transmission (mechanical); (c) Electricity; (d) Heating Apparatus; (e) Gases; (f) Oils, Paints, and Other Inflammable Liquids; (g) Housekeeping; (h) Matches and Smoking.

Power Generation

Boiler Rooms. Comparatively few fires originate within boiler rooms except from some easily remedied cause, such as piles of refuse, hot ashes in wooden barrels, and the like. Boiler rooms are ordinarily constructed throughout of fire-proof material and, in the case of high-pressure boilers, usually placed in a separate building away from the main plant buildings.

It is inadvisable to place wooden boards or wooden foot walks over boiler settings, or in fact, any construction of wood near the boilers. Foot walks and stairs or ladders, for access to them should be of steel construction. If boiler rooms are kept clean and the accumulation of rubbish and inflammable material prevented, there is not much chance of fire starting.

Burning Refuse. Wherever refuse, sweepings, and waste such as trimmings and lint is burned under boilers, it should be burned promptly when received and not permitted to remain stored in the boiler room. There is danger in mixing such waste with coal, even in small quantities, unless it is to be burned immediately. If such material is stored, it should be placed in a fire-proof bin or vault outside of the boiler room proper.

Coal. Fire often starts in soft coal storage, therefore it is not advisable to store coal against wooden walls, nor in quantities inside of buildings. The storage places should preferably be removed from buildings, and only an amount sufficient for immediate needs kept in boiler room, and this not piled near the boilers. Ventilating tunnels, of metal, placed at intervals of 15 to 20 feet have been suggested to prevent fire starting in coal storage piles. Where stokers are used, it is, of course, necessary to store a supply of coal in hoppers over the stokers. This is kept in motion so that there is little danger of combustion starting.

Ashes. Only metal containers should be used for the removal of ashes, and the ashes should be kept in metal bins or piled, preferably on a concrete floor. The ash pile should not be adjacent to wooden structures or other inflammable material. The throwing of waste and refuse matter into ash piles, or when removing them from boiler houses, often leads to fire. Such material may become ignited from heat in the ashes and a fire may result.

Boiler Stacks. Occasionally a fire starts around stacks which are carried through wooden roofs. When stacks must be taken through wooden roofs, liberal clearance should be allowed.

Engine Room. Steampipes should never be in contact with woodwork. The heat from such pipes is apt to ignite the wood. Fires often result when waste or rags are left lying on hot portions of power house machinery. A special place should be provided for keeping such material; a table for oil cans and tools, and a suitable container with elevated legs and a spring cover for waste. Lint and waste may accumulate in fly-wheel pits and ignite spontaneously, or possibly from a lighted match or cigarette stump thrown into the pit. There should be means for cleaning fly-wheel pits so that refuse will not accumulate in them.

Gas Engines. The National Board of Fire Underwriters has issued complete rules for the construction and installation of gasoline, kerosene, and gas engines, and these should be consulted where such apparatus is used. Care should be taken that the exhaust pipe from each engine is muffled, and that no wood or combustible material is near the exhaust. Where exhaust pipe passes through a combustible partition, the woodwork must be protected. This may be done by providing a double thimble made of two concentric rings of sheet metal with at least one inch air space between, and with outer ring covered with asbestos, or else a casing of solid masonry. Ventilation through the opening is essential.

Power Transmission

(Mechanical)

Shafting. The principal hazard from power transmission is that of overheated shaft bearings; serious fires have frequently resulted from this cause. All shaft lines should be carefully installed and maintained in a good condition. Shafting out of line quickly causes overheated bearings. There is danger also when any material becomes wound about the

shaft, as it may rub against adjacent parts of structure. The hangers and bearings should preferably not be near woodwork. Roller or ball bearings are desirable, but where these are not used self-oiling bearings are recommended. Frequent inspection should be provided beneath all bearings, and these should be emptied frequently to prevent oil dripping on the floor or inflammable material below.

Belts. Probably the next most important cause of fire in the transmission of power is that of belts rubbing against woodwork. Wherever belts pass through wooden floors, walls, or partitions, ample clearance should be provided so that the belt will not rub against the woodwork. It is well to limit the play of belt by some form of metal roller. Metal belt shifters are recommended instead of wooden ones; if wood is used that portion of shifter which comes in contact with the belt should be protected by metal.

Static Electricity. Static electricity is the result of friction caused by the rubbing of the belt against the pulleys. To remove the static electricity from moving parts three methods have been used with satisfaction:

(a) A glycerine belt dressing.
(b) Grounding of hangers and shafting.
(c) Use of copper comb collector and grounding.

In locations where inflammable vapors or dusts are present and static electricity would create a considerable fire hazard, it is advisable not to install belt drives at all. Drives by shafting through partitions or direct motor drive properly enclosed are preferable under all such conditions.

Electricity

Electric arcs and overheating of electric equipment are the causes of many electric fires. The principal causes of electric arcs are switches with poor contract points, switches exposed to metal contact or to a ground, poor contact in splices and connections, worn insulation, moisture, crossed wires, etc.

Switches. Switch points should not be ragged and loose, but should provide a smooth, tight contact. Enclosed switches only are recommended for use, both because of the danger of arcing, and because the enclosing case prevents accidental contact of objects, or an operator, with live parts.

Circuits. Improperly made joints (splices) in electrical circuits are a common cause of fires. Joints should be soldered and taped so as to provide a permanent, secure contact between the wires for the passing of current. It is advisable, also, where feasible, that electric circuits be installed in conduit for protection against mechanical injury, and from moisture and fumes.

Temporary Wiring. Frequently temporary wiring is put up to be used for a short time and this is sometimes permitted to remain for permanent use. Temporary wiring should be installed in a safe manner and should not be allowed to become permanent. Dead wiring should be removed, because of the possibility of its being connected up after a period of disuse, when it is likely to have deteriorated.

Overheating. The principal cause of overheating of electrical equipment is overloading. Fuses and circuit breakers are the safety valves of electrical systems; all circuits should be so protected. Sometimes copper wire is carelessly inserted in place of a fuse, thus permitting too heavy a current to pass through the circuit, with serious results. The use of too large fuses is a frequent cause of fire, and it is very necessary that the fuse be of a size suitable for the load of the circuit. Fuses in which the fuse wires are enclosed are recommended.

Motors and Generators. All motors and generators should be installed in a dry place and should not be exposed to corrosive fumes, inflammable gases, or flying material such as dust and lint. Sparks from the commutator may ignite gases or dust, therefore in hazardous locations it is advisable that motors be entirely enclosed (air may be supplied from an outside source and discharged again to the outside) or else be installed outside of the room, and the shaft extended through wall. Proper lubrication of motor and generator bearings is, of course, essential to prevent overheating and possible fire.

Portable and Pendant Cords. Portable and pendant lamps are frequent causes of fire, because of defective insulation. Sometimes the cords have been hung on nails or other metal objects, and through continual vibration are worn until contact is made, and a short circuit results. Ordinary lamp cords are often used in a wet place and become soaked with water, thus causing a short circuit. Rubber insulation deteriorates with time, and the cord must be renewed. Portable lamps should be used only when absolutely required, such as for purposes of cleaning out boilers, entering manholes, and the like, and then only heavy reinforced cords should be employed, so as to withstand wear and prevent short circuiting. Water-proof cords and sockets are necessary where exposed to dampness. Pendant lamps (drop cords) are not advisable and should not be used when a permanent, rigid fixture can be installed. Wherever pendant lamps are used, the cord should hang vertically from the supporting fixture, and never be hung over nails, machine parts or other objects.

Heating Apparatus

Defective Flues. Probably the most frequent cause of fire from heating apparatus and loose joints or rust holes in smoke pipes are examples of such defects. These are responsible for practically all fires which originate in walls or in partitions around smokestacks and flues. All chimneys should be thoroughly inspected and cleaned at least once each year. Smoke pipes should be carefully inspected in the fall, before the first fire is built, to make sure that the joints are tight, and that rust has not eaten away

the pipe so that it is unsafe. Occasional inspection thereafter is also advisable.

Protection of Woodwork. Woodwork near furnaces, stoves, and smoke pipes should be protected either by covering the heating apparatus or pipe, or by interposing a metal or asbestos sheet placed about three inches from the woodwork. The space behind such a shield should always be kept clear to permit free air circulation.

No metal smoke pipe should be placed nearer to any combustible wall or partition than the diameter of the pipe, nor nearer any combustible ceiling than 1½ times the diameter, unless such wall partition or ceiling is protected by asbestos board of sheet metal.

Overheated Stoves. It is not infrequent in many industrial plants to find small offices in various departments heated by coal or wood stoves. These offices are apt to accumulate rubbish and papers, including various shop forms, and often present serious fire hazards, because of their wooden construction, the inflammable material in them, and because they are frequently used as a sort of shop smoking room. Fires occasionally result in such rooms when the stoves are filled with fuel, and all persons leave the room temporarily. The overheated stove sets the surrounding woodwork on fire, or the red hot smoke-pipe ignites the wall or ceiling.

Forges and Furnaces. In practically all industrial plants will be found various types of forges, furnaces, ovens, kilns, retorts, and the like which are heated by gas, oil, coal or wood, and frequently by electricity or steam. Certain fundamental principles are important to guard against fire in the use of such apparatus:

(a) It should not be installed near woodwork or other inflammable material.

(b) Where gases and liquids are used for fuel, pipes instead of tubing should be used for piping the fuel. The piping (for liquids) should be so arranged that the fuel will drain to the supply tank in case of a break in the pipe.

(c) A dependable shut-off valve should be located at a safe distance from the furnace.

(d) Where wood, coal or coke is used for the fuel, care is necessary in the disposal of the ashes.

(e) For electrically heated apparatus, a light indicating when the current is on is advisable.

Gases

Location of Fixtures. Movable gas jets are especially inadvisable because they may be swung against woodwork and ignite it; stationary fixtures are therefore recommended. If moveable fixtures are used, suitable stops should be provided to prevent the fixture from being swung against inflammable material.

Connections. The use of rubber tubing on connections to gas heaters, stoves, furnaces, and other such equipment is not advisable. Tubing deteriorates with age, dries out and cracks so that a leak is apt to develop. The tubing may also be pulled from the connection at either end, creating the possibility of a fire or of asphyxiation of persons present. Where it is necessary that tubing be used, it should be of the best quality and should be securely fastened to fittings at both ends. Flexible metal-covered tubing is preferable. A shut-off valve should be provided only on the gas supply pipe so that no gas will be left in the tubing when valve is closed.

Leaks in piping and fixtures are also likely to cause fire or explosion and it is therefore important that such fixtures be installed only by competent workmen. Leaks, of course, should not be looked for with a lighted match or other open flame; gas-proof electric pocket flash lamps are desirable.

Every gas supply main should have an efficient shut-off valve, outside of the building, and easily accessible, in case of fire. An automatic shut off is not advisable, because it may be desired to have gas available for illuminating purposes even after an accident or fire has resulted.

Oils, Paints, and Other Inflammable Liquids

Kerosene, gasoline, paints, and other inflammable liquids wherever used constitute a very important fire hazard. These substances are more to be feared because of the danger of spontaneous combustion of materials such as rags, waste, burlap, and clothing, in which some of the liquids may be absorbed. Vegetable and animal oils are particularly liable to cause spontaneous combustion.

Storage Tanks. Large quantities of fuel oil, gasoline, kerosene, and such liquids should preferably be stored in tanks buried underground. Pits are objectionable because vapors may accumulate in them. The tanks, if above ground, should be enclosed by a retaining wall or an earth embankment, and should be electrically grounded. Each underground storage tank should have a vent pipe extending above the roof and turned down at upper end with screened opening.

Oil House. Where the quantity of oils used is not sufficient to require large storage tanks, oil house in which several barrels or containers of various oils may be stored are desirable. Oil houses should be placed at some distance from other plant buildings, so that, should fire start in the oil house, it will not endanger the other buildings. Oil barrels should not be placed upon wooden floor or wooden racks but upon a cement floor, or else on concrete blocks or brick. Only electric lights with vapor-proof globes should be used for lighting oil houses, and smoking should never be permitted in or near them.

Local Supplies. Local supplies of gasoline, kerosene, and similar substances should be kept in safety cans, which will not leak when inverted. Only a sufficient quantity should be taken into plant buildings to satisfy the daily needs. Metal pens should also be provided in which to set cans containing local sup-

plies of oil, gasoline, kerosene, etc., and preferably such local supplies should be stored in a metal cupboard.

Oil Drip Pans. Metal drip pans should be provided under all machines using cutting oil, to catch the oil drippings, and the oily turnings and shavings in the machine shops of mills.

Paint Vats. On account of the inflammability of some paints, serious fires will sure result unless due precautions are taken in their use. Fire will easily start in such liquids and when once started burns fiercely, and is very difficult to extinguish. Under no circumstances should smoking or the use of open lights be permitted where these liquids are used.

Housekeeping

Cleanliness. It is likely that no one cause leads to more fires than bad housekeeping, as it were, around the mill. Accumulations of combustible refuse, such as oil-soaked and paint-covered clothing, rags, waste, excelsior, and shavings, create a very serious fire hazard. All such materials should be removed each day from every workroom and deposited in receptacles provided for the purpose. Self-closing metal containers or waste cans, in which to place oil-soaked waste and rags should be provided at convenient locations about workrooms, and such material should not be left on the floors, nor placed in lockers, cupboards, or bins. At the end of the day, these waste cans should be emptied and the contents safely disposed of.

Rubbish Burning. Fires have often been caused by burning rubbish too near combustible buildings, sheds, lumber piles, or fences; also by starting rubbish fires on windy days, and in locations where grass or other inflammable material has spread the fire. Rubbish should preferably be burned in a suitable enclosure (or burner) made of metal, brick or concrete, and provided with a screened covering to prevent the escape of sparks and embers. If burned in the open no fire should ever be started on a windy day, or within 50 feet of any combustible building or material, or within 20 feet of any structure.

Lockers. Workmen will often leave oily waste in their clothes or throw a handful in the bottom of locker, and as a result a fire is apt to occur. Metal lockers are, in every case, advisable because there is always a certain amount of oil and moisture in workmen's clothes which may cause spontaneous combustion. The lockers should be of sufficient size so that clothing may be hung up to permit free air circulation.

Inspection. Frequent periodical inspections are important to make sure that refuse and waste material of an inflammable nature does not accumulate in quantities which would constitute a fire hazard and that all workmen's lockers are kept clean, and do not contain paint-covered or oily clothing or oil-soaked waste and rags. The inspector should also examine the fire-fighting equipment and apparatus to see that it is in good condition and easily accessible.

Matches and Smoking

Several of the most serious fires on record are known to have been caused by lighted matches being thrown aside, or by burning cigarette or cigar stump. The use of matches in industrial plants should be reduced to a minimum and, where they are required, it is recommended that matches of the safety type only be furnished.

There is a growing tendency to prohibit smoking in all departments of manufacturing plants where there is any risk of fire. Smoking should centainly be prohibited in most all departments of a paper mill and wherever inflammable liquids such as gasoline, kerosene, paints and the like are stored or used. In all such rooms "No Smoking" signs should be placed, and the rule should be strictly enforced. Where smoking is prohibited in the plant except in certain departments, or during specified hours, it is well also to post signs to that effect.

Cooking Sulphite Pulp

By EDWARD M. LENGES

THE relations of digester cooking, reclaiming of acid, and acid systems, which are so important to the good production of sulphite, is an interesting subject.

In my fourteen years' experience as acid maker on milk of lime and tower systems, I have often heard arguments in regard to acid plants, but I only heard of two men (one of whom was Mr. O. L. Berger, who addressed us at the Chicago Convention) who really found the most important place in the acid making process, and that is when your acid is mixed in the reclaimer. Here is the place where acid is finished. Of course, one must have good acid from the system to start with.

I found that in order to secure a good sulphite production cheaply, you must have a good acid system, and a good reclaiming system to go with it. At the time I took charge of this mill, we had the old wood tower system, which was very unsatisfactory in many ways, chiefly on repairs, labor and leakage. We soon replaced these with the Jenssen concrete acid towers, which, piped up in the proper way, give excellent results. They can be run very economically in regard to power, labor, repairs, etc. But when first installed, they did not satisfy me, as it seemed I could not produce the amount of acid wanted, and the sulphur consumption was too high. By experimenting, we found that I was not getting the full benefit of the return gas from the digester.

I wish to explain that we do not use a gas saparator. We merely blow the digester liquor through a cooler direct to the reclaiming tank, which is 14′ high and 24′ in diameter, and the digester gas is blown through

(*Continued on page* 1158)

The Use of Fillers for Paper

By ALEX W. MACVIE

Presented at the January Meeting of the Ohio Division

ONCE I heard a mother say, referring to a mischievous kid, "The devil's in it," and I think that expression can also be put down to what the printer said only ten years ago regarding paper fillers, and it was you men who put the devil in it. Well, supposing that is so, most of us will admit that it takes a wee bit of the devil in us, so that we can be true-blooded American citizens and fight for the principles we believe in.

The greatest trouble between the printer and the papermaker only ten years ago was that the printer thought that he knew more about paper making than the paper maker, and the paper maker, in turn, thought he knew more about printing paper than the printer. The organizing of the printers, and the organizing of the paper makers have brought the two trades considerably closer together, and the result is that the printer today thoroughly believes that it takes a wee bit of the devil in the paper to make it print well, and as time goes by we shall see more filler used in paper. This has demonstrated itself in the older countries where a larger percentage of filler is used. If the paper maker had not made good use of fillers for paper, it might have been today that the printer would have had to set his type in corrugated fashion to meet the uneven surface. If there had not been a material available to fill up the porous nature of fibre, what would be the price of paper today with fibre continually getting more scarce and more expensive? Too bad that we have not found a way yet to make newsprint out of nothing but filler. Surely the paper filler, once badly cussed and called the devil, is not such a bad fellow after all, and both the printer and the paper maker think well of him today.

Advantages Gained

The most important parts the filler plays in paper are: first, it gives a surface to paper, so that the printer can easily put out a good readable sheet to the public, and second, it gives a more flexible nature to paper so that the printer can run it through the fast presses without cracking, thereby saving him lots of trouble and thus enabling him to meet the ever-growing demand. Summing it up, it enables the paper maker to make a more solid, flexible product for the printer, and this is just what he desires.

Now taking the disadvantages of filler in paper, we find them unimportant in 90 per cent or more of the paper that is manufactured today, and are, for instance, that they decrease the life of the paper—prevent a sheet from being well sized—or are detrimental where strength is required.

Fillers can be well-used and ill-used like anything else, and you must remember that a sponge can only hold so much water and no more. Too much of the devil in anyone cannot compare with the wee bit. The printing machine has the say as to how much filler a paper requires, and this is slowly but surely telling you men to increase on your percentage of filler. The printer recognizes today that you men put a feather in his cap when you fill in the porous nature of his stock, and he is working as much on the filler theory as you are, and has come to see that the devil is not such a bad fellow after he got to know him well enough.

Different Qualities

There are three fillers on the market today. The aluminum filler; for example, china clay, the magnesium filler, and calcium fillers. China clay and magnesium fillers are all mined, washed, refined, etc. Calcium fillers are of two kinds: the mined filler, as mineral white, etc.; and the precipitated filler, which is the purest filler we have today, but it is also the most expensive.

The principal fillers are magnesium and aluminum silicates, also various calcium products or, in their commercial names, china clays, talcs and lime products. Ninety per cent of them, if not more, are materials merely mined, washed and refined before you get them; the others are chemically made. The chemical filler is considerably more pure, that is, more free from any hard substances, better color and much more expensive. Practical experience has shown me that the retention, which is the financial value of a filler, is much greater in a natural filler than in a chemically prepared one. The one most commonly used is clay, both the English and domestic product. It would be only right to term the quality of domestic as a second growth as compared with the quality of English, and the price of the two grades verifies this; but we are lucky to have a No. 1 and No. 2 grade to use, so that you men can figure which to use according to what you are to make, and what you are to receive in dollars and cents for your finished product. So far it has not been proved that English will give any better retention than domestic, and my own chemical and practical experience has shown me no difference wha ever in this respect. The retention should be approximately 60 to 70 per cent, and you can easily get this by seeing that you have the right mesh of wire and correct sizing method, and by all means use all your back water from your suction

boxes. However, the English quality has a better color and a finer grain than the domestic product and the bulk of the English is used on coated papers, where the price will permit the extra cost. There is not the slightest reason, however, why domestic should not be used entirely as the china clay filler, replacing the English now being used. There has been rapid progress made since the beginning of the war in domestic clays, and this progress, I am pleased to tell you, is continuing, and you will see the quality of domestic still greater improved during the next four or five years. As I stated before, fibre will hold only so much filler, and you might use for a maximum basis, say, 22 per cent ash in a sheet 25 by 38, 50 pounds, which would mean in actual clay put in your beater, approximately 35 per cent. All grades of china clay give a lustre and glossy smoothness to paper, which other fillers cannot imitate, even if the others give as good and even a surface.

Do not rely on trade names. The clay fillers have three or four names; the talcs, all kinds of names; and the lime products have ten or twelve names. There is some talk of gypsum as a filler. A filler must contain aluminum; it really gives smoothness to the paper. The printer is no longer looking for a glossy paper. He wants a paper that is even, good and solid.

I had the good luck to be in the paper business abroad. There is no paper made abroad that we cannot make here. We have the material, the machinery, etc. There is lots of paper being imported because we were not organized, and could not get after the foreign competition.

Now coming to talcs, which you might call soapstone products, they give a slightly higher retention than China clay. They are mostly used where a bright glossy surface is not an essential, that is, cheaper grades of paper, as they invariably give a duller finish, although perhaps smooth enough. The retention of talcs should run approximately 10 per cent greater than of clay; if same are as free from grit as possible, they make an economical filler for the cheaper grades of paper.

Coming to calcium products, in this lot we have the natural mineral and the chemically made. Their colors are even whiter than the best of China clays, but they lack in retention, same being approximately 15 per cent less than with China clay. The characteristics these fillers give to paper are vastly different from either talc or China clay. They produce a hard surface, not smooth or glossy, but their best advantage is in giving a nice rattle and firmness to the sheet similar to what starch would give, and I have always felt like terming these products the finest substitutes. These fillers are good for bonds, drawing paper, egg shell, etc.

In summing up all, it is plain to see that there is more to be gained by using filler than by calling them devils and avoiding them.

Before closing I would like to put before you something that I have had in mind for some time, and in connection with which, I have even done a little practical work. It gave me an insight into a way of increasing the retention of fillers, China clay, especially. Silicate of Soda has been used for some time and put directly into the beater. I believe that by the use of, say 2 per cent solution, and this percentage figured on your original weight of dry clay, to be mixed with and come through with your clay solution, you will find that you have undoubtedly increased your retention, and at the same time have put your clay in a better condition to run through your screens. This alkali changes the colloidal nature of the clay. The action of the alum on your silicate holds your clay more in the sheet, filling up the sheet better and increasing the retention—as I have personally found out by doing this—as high as 100 per cent. The silicate also helps to size and cement the fibers together and, on the whole, this method is beneficial.

Some Questions and Answers

Question—What will be the result if there is not enough alum when the silicate of soda is added? Answer—There has to be 1 per cent to 1½ per cent excess alum. If there is not, by the time the paper is to be printed, the color may disappear.

Q.—Is the clay and silicate of soda combined in liquid form? A.—Yes.

Q.—Did you ever use starch, and clay, and silicate? A.—Yes; but the cost of the starch is more than the results are worth. The results obtained from starch are not good enough for the price you pay. I have made retention tests of starch in paper and the additional retention is very small with starch alone, or combined with other materials.

Q.—Is silicate of soda beneficial in hard size paper? A.—Silicate of soda naturally decreases size. It makes paper look hard but the size has depreciated. Silicate of soda is not added for size, but retention.

Q.—Do you put alum in before, or after the size? A.—This is the order: Clay; size; alum.

Q.—Have you had any experience with boiling clay with starch? A.—The tendency is to increase the retention. The steam used in boiling will cost more than the results. By boiling clay you will get high finish.

Q.—But is high finish wanted? A.—You probably misunderstand me when I say high finish; by high finish, I mean evenness. The printer wants a well-filled surface.

Q.—Is there any danger of killing the color by using Silicate of soda? A.—It depends entirely on what color you have.

From 40 to 3,800 Members in Six Years

By LOUIS RESNICK

LIKE many other of the country's greatest institutions, the National Safety Council is the child of necessity. It is an organization that grew out of a great need, felt by the managers of industrial plants who were doing pioneer accident prevention work during 1912, and the half dozen years immediately preceding it—a need for an exchange of experiences in this work.

No sooner had a few companies demonstrated what remarkable reductions could be made in accidents, and what a great economic gain was yielded by accident prevention work, than other companies all over the country began to burden the pioneers in safety with inquiries for information. So great was this demand, that the idea of forming a national clearing house for accident prevention information suggested itself to a group of some two dozen men who were in charge of safety work in as many plants.

The National Safety Council was officially organized in New York City, September 23, 1913.

The purpose of the organization as outlined by R. W. Campbell, the first president, follows:

"To promote the conservation of human life and its incidents in the industries of the nation, and to that end:

"(a) To establish a conveniently located headquarters for the maintenance of a clearing house of safety information, available to all concerned.

"(b) To encourage and promote throughout the country the organization of those engaged or interested in safety work into District and Local Councils, in affiliation with this National Council.

"(c) To hold annual congresses, at which all persons interested in accident prevention and kindred subjects may take part in practical discussion of vital problems, and also have opportunity to examine carefully prepared exhibits; to publish and give wide distribution to proceedings of such congresses.

"(d) To encourage and assist in the practical standardization of safety devices, safe conditions and practices.

"(e) To give the widest publicity, through its own publications and other channels, to all matters calculated to promote industrial safety.

"(f) In general, to initiate, promote, co-operate with and obtain the assistance of, any and all activities or agencies calculated to conserve human life and its incidents in the Nation's industries; and to participate in and aid other activities for the welfare of the industrial workers of the country."

While the roster of the National Safety Council has grown from a promise of fourteen memberships in 1912 to approximately 4,000 industrial concerns operating more than 7,500 plants and employing more than 6,000,000 workers in 1920, and while the scope and service of the Council have gone far beyond the bounds of the original plans, the purposes outlined by its first president are substantially the purposes of the Council today.

Shortly after the opening of the headquarters in Chicago, the general manager, Mr. W. H. Cameron, through his contact with employers, realized the need of a defiunite weekly service to members which resulted in the development of the now extensive bulletin service of the Council.

Development of Local Councils

In the earliest years of the Council a need for local organizations which would conduct meetings for workmen, foremen, and executives, and accomplish what it was imposible to accomplish through printed matter sent from the national headquarters, became apparent. Council, therefore, set about organizing locals, of which there are now 40 in operation, and at least a dozen in the process of formation.

Introduction of Safe Practice Pamphlets

In 1916, the Council began to supplement its weekly bulletin service by monthly safe practices pamphlets, in each of which a particular hazard was discussed in detail, and the safe practices in the construction and operation of the particular equipment involved were described. This service has been developed to the point where each safe practices pamphlet represents the result of extensive research work on the part of a high grade safety engineer with the co-operation of a conference committee of seventy-five of the country's most eminent safety engineers.

Creation of the Engineering Department

In 1917, the Council created an engineering department which, since then, has had in charge the preparation of all bulletins and safe practices pamphlets. This department now includes four safety engineers, who serve the membership not only in the preparation of bulletins and safe practices, but in investigating and answering all inquiries for technical information.

The N. S. C. Library

What began merely as a file of information sent in by members has developed into the most complete library on accident prevention in the country. The N. S. C. library has 10,000 booklets and pamphlets, 500 books, 5,000 clippings of special articles, and

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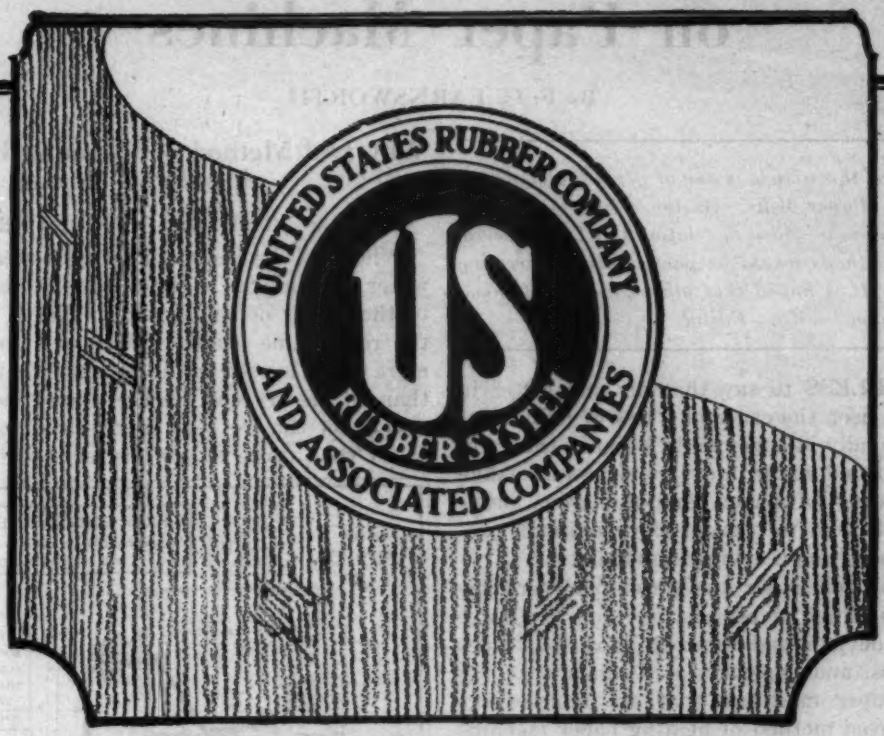

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In advising with your operating heads as to the most efficient and most economical rubber equipment, there is back of our representative the accumulated experience and combined knowledge of the oldest and largest rubber organization in the world.

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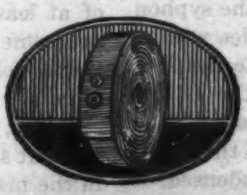

Keeping the Air and Water Out of Dryers on Paper Machines

By F. C. FARNSWORTH

The subject of this article is one of great economic importance to the Paper Mills. As the article is only the expression of one man's idea in relation to it, the description of other methods would be particularly interesting and beneficial. It is hoped that others will avail themselves of this opportunity.—Editor.

IT IS NEEDLESS to say that air and water in dryers has been the cause of a loss of millions of dollars annually in paper mills, because the accumulation of air and water in dryers causes breakage of paper, cockling of paper, and numerous other troubles, which tend to prevent the maximum production of paper from a drying standpoint.

The accumulation of air and water in dryers has led to the installing of complicated and expensive steam control devices, and hundreds of various types of steam traps, and expensive experimental piping layouts for paper machines that are unnecessary with an improved method of heating paper machine dryers.

A New Method of Draining Dryers

With a differential system relieving the return line header, water and air in the dryer is forced through the syphons or buckets out into the return line header, because the steam in this return line header is utilized to heat a few dryers of the wet end section. Naturally, we produce the desired reduction in pressure between the steam and return header necessary to force the water out of the dryer, or, in other words, we might say that the dryer becomes a part of the steam line necessary to supply 25% of the dryers on the wet end of the paper machine.

The steam must pass from the main steam header, through the dryers, out through the syphon pipes or buckets, into the main return line header, through a steam separator which separates the steam from the water, and the steam is passed over into the dryers of the wet end at a reduced pressure temperature.

A high velocity of steam pouring out of the syphon pipe into the main return line header carries with it all water and all air that would otherwise accumulate in the dryer, thus providing a high circulation of dry steam in the dryers. It is, however, understood that the steam must condense in the dryer to throw off the latent heat, but after it has been condensed, it cannot possibly lie in the dryers as shown in Fig. 1.

Why Old Method of Draining Return Line Header Is Wrong

THE SYPHON DRYER

When the dryers are filled with steam, naturally, water accumulates in the bottom and has to be lifted to the center of the dryer, so that it will flow into the return line header. It is well understood that more steam is used on the wet end of a paper machine than on the dry end. Hence, the syphon pipe of the dryers on the wet end is required to handle more water than those on the dry end, with the common

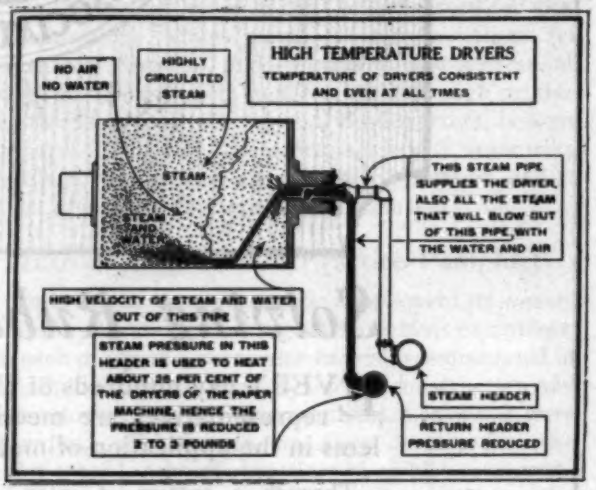
NO AIR
NO WATER
HIGHLY CIRCULATED STEAM
HIGH TEMPERATURE DRYERS
TEMPERATURE OF DRYERS CONSISTENT AND EVEN AT ALL TIMES
STEAM
STEAM AND WATER
THIS STEAM PIPE SUPPLIES THE DRYER, ALSO ALL THE STEAM THAT WILL BLOW OUT OF THIS PIPE, WITH THE WATER AND AIR
HIGH VELOCITY OF STEAM AND WATER OUT OF THIS PIPE
STEAM PRESSURE IN THIS HEADER IS USED TO HEAT ABOUT 25 PER CENT OF THE DRYERS OF THE PAPER MACHINE, HENCE THE PRESSURE IS REDUCED 2 TO 3 POUNDS
STEAM HEADER
RETURN HEADER PRESSURE REDUCED

Figure 1

result that steam passes through the syphon pipes of the dryers on the dry end of the paper machine, and out into the main return line header, so that it builds up a pressure of steam in the return line header which is practically equal to the steam pressure on the steam header.

With this condition, there is no differential pressure between the steam header and the return header. Therefore, it is not possible for the water in the bottom of the dryer to lift up through the syphon pipe, which ranges anywhere from fifteen to thirty inches in height; consequently, a pressure difference of at least one-half pound pressure is necessary to overcome a static head of the syphon pipe between the bottom of the dryer and the center of the trunnion.

Hence, the water cannot be lifted out of the dryers without sufficient differential or reduction in pressure in the main return line header to cause the pressure

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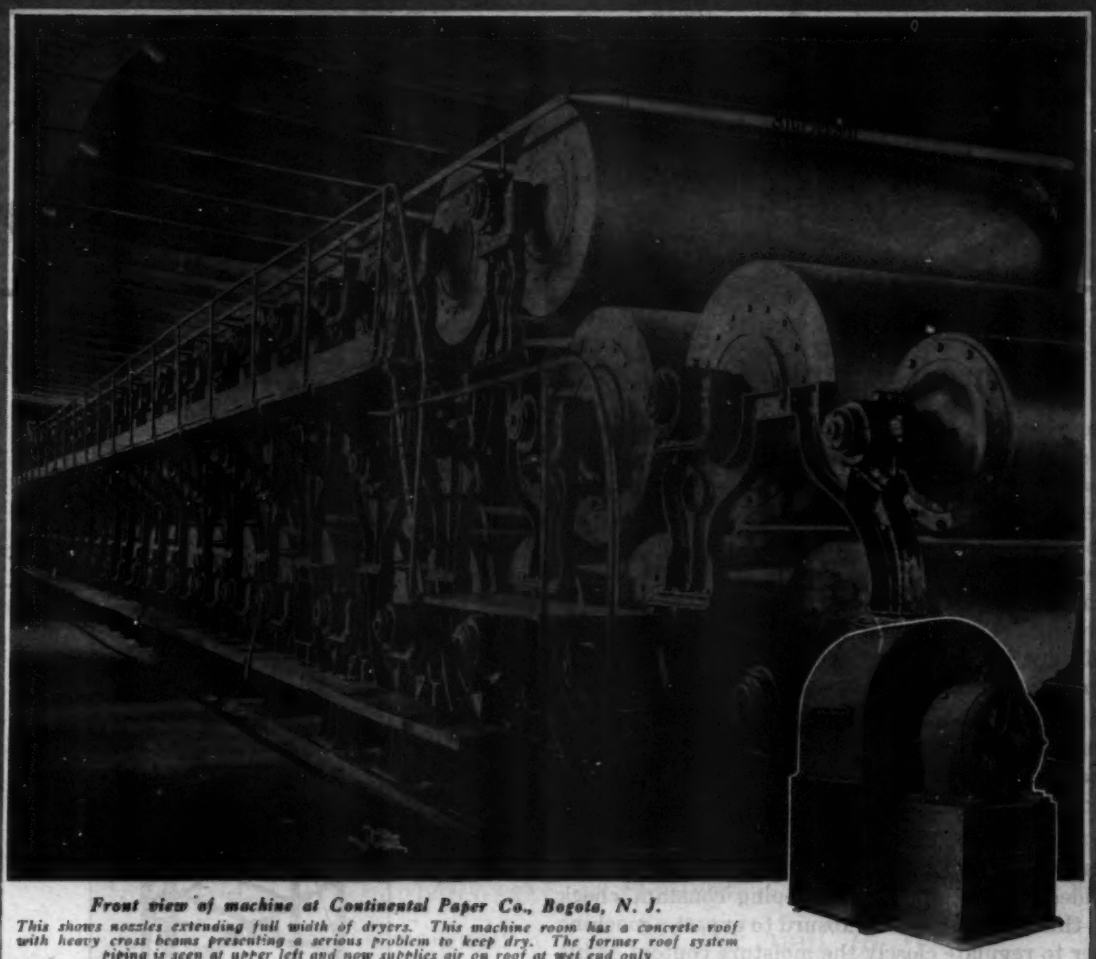

Front view of machine at Continental Paper Co., Bogota, N. J.
This shows nozzles extending full width of dryers. This machine room has a concrete roof with heavy cross beams presenting a serious problem to keep dry. The former roof system piping is seen at upper left and now supplies air on roof at wet end only

FOGLESS MACHINE ROOMS

Freedom from fog is a fundamental factor in satisfactory machine-room output. By introducing air around the dryers this moisture is absorbed before it gets into the room.

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accomplish this result by blowing thousands of cubic feet of warm air into the vapor pockets caused by the wet sheet. Not a trace of fog is left.

Better quality of paper is produced because of possible lower temperature. Tonnage per machine is increased.

The Sturtevant System is a splendid investment simply as a dryer, but the added possibility of heating and ventilating your machine, beater, and finishing rooms makes it an investment with big returns.

Did you read about the new system in the Nuera Mill? It's on page 42 of the December 13th **Paper Mill.**

Catalog **24323** *for the asking*

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AND ALL PRINCIPAL CITIES

Moisture Content of Paper

For years paper manufacturers have felt the need of a simple, practical method of determining quickly and accurately the moisture content of paper as it comes from the machine.

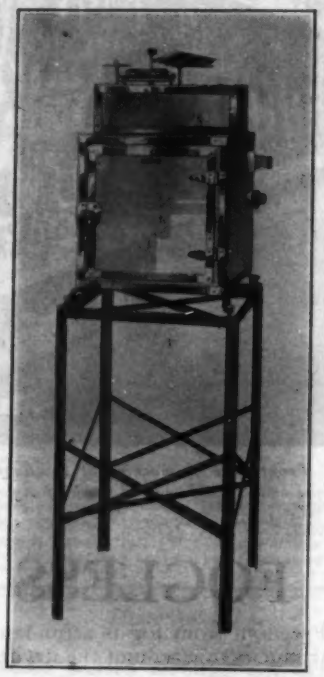
The losses from the shipment of over-dry paper are enormous. Even two or three per cent over-dry means a considerable loss of tonnage, as paper is sold by weight. To this must be added the fuel losses at the dryers, as well as production losses due to breaks on machine in running over-dry paper.

Constant complaints are coming back to the paper manufacturers from the publishers that their paper is too dry, resulting in breaks and unsatisfactory work upon the presses.

It is a difficult thing to maintain production of paper of uniform moisture content unless a mill is provided with facilities for keeping constant check upon this. It is almost as absurd to expect a machine tender to regulate closely the moisture content of his paper unless he is provided with facilities for knowing the moisture, as it would be to expect a fireman down in the boiler-room to keep the desired steam pressure without providing him with a steam gauge.

In some of the larger mills equipped with chemical laboratories and facilities for testing, control samples from the machine are taken from time to time and the moisture content determined, but usually, the results of these tests come in too late to make proper adjustments and corrections upon the dryers. What has been needed is a simple practical device not too delicate to set right up in the machine room, not difficult to operate, with which anyone without special technical training, could determine accurately in a short time, say five to ten minutes, the moisture content of the paper as it is coming off the machine.

Realizing this need, F. M. Williams, who for twenty years has been consulting chemist and chemical engineer for paper manufacturers, and is now official chemist of the Technical Association of the American Pulp and Paper Industry, as well as the American Association of Woodpulp Importers, and also a member of the rules committee upon Standard Methods of Sampling and Testing Woodpulp, has recently developed a practical instrument for the determination of moisture in paper.



It consists of a double walled electrical oven with thermostat control, accurate balances, with beam graduated to read per cent of moisture directly, thereby requiring no calculation.

Its operation is exceedingly simple. The samples are weighed on the outside of the oven, after which they are transferred to the inside where they are quickly dried to constant weight, in ten minutes or less time, depending on thickness of sheet.

When constant weight is obtained, the percentage loss of moisture is read directly upon graduated scale beam.

In sampling the paper, the basis weight sample ordinarily taken may be used as a sample for drying, or by the use of a special sampling knife, a strip sample may be taken clear across the roll. The latter method of sampling gives the actual average moisture content of the paper over the full width of the

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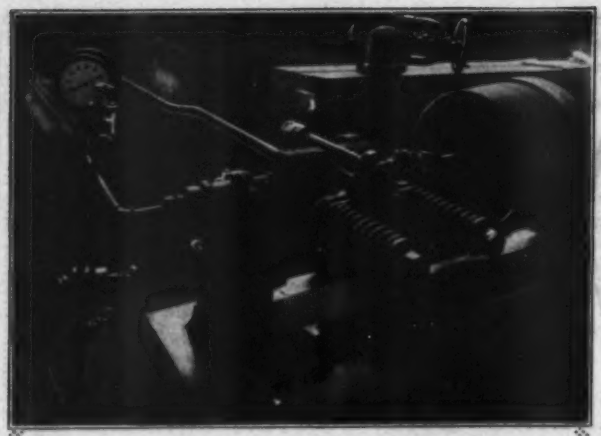


This is the NASH AIR SHAKE, which will produce a more even shake, and therefore better sheet of paper than can be made by any present method.

Prepare for Normal Times

THIS is the advice of the management of a mill that has never solicited for business. Make your paper better than your competitor and you will get the business. The **Nash Air Shake** will do this for you, and then some; but remember the facilities for building this machine are limited to about six each month. First come first served. Some of you must wait, but do not wait too long or you won't be in line.

WILLIAM C. NASH

NEENAH, WIS.

machine, as it is a well-known fact that moisture content varies considerably across the width of the roll, sometimes ends being dryer than the middle, and vice versa.

The practical utility of an instrument of this kind is obvious to every paper manufacturer, and it is a wonder that this very important detail of paper manufacturing has not been given serious consideration long ago.

Paper Making Machine

An invention has recently been made by Nickolas J. Niks, superintendent of the Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich., whereby the combination of the press felt and a second felt with the couch roll, press rolls and the drying cylinder provides an arrangement in which there is little liklihood of breakage in the web, and consequent loss of

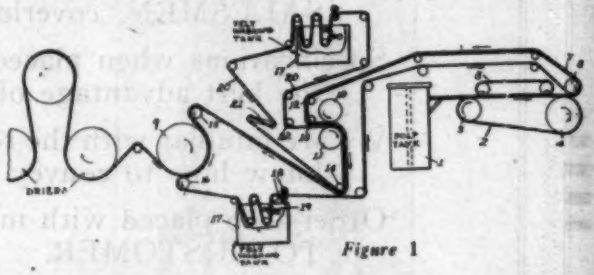


Figure 1

time and material, even when manufacturing very thin paper.

In the illustration, Fig. 1, is shown the invention applied to a Harper-Fourdrinier type of machine, where the web is transferred from the wire (2) to the press felt (7) which extends and delivers it to the first drying cylinder (9). The forward reach of the web passes through the press rolls, one of which is preferably a suction roll, and is joined at guide roll

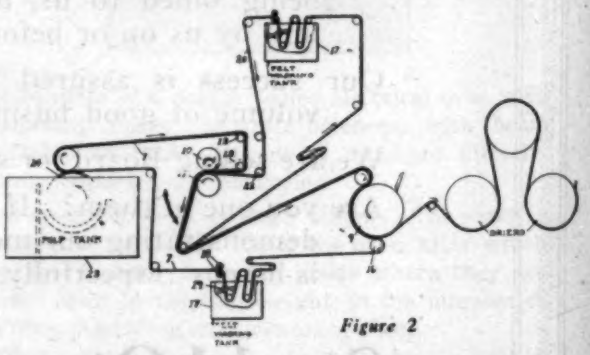
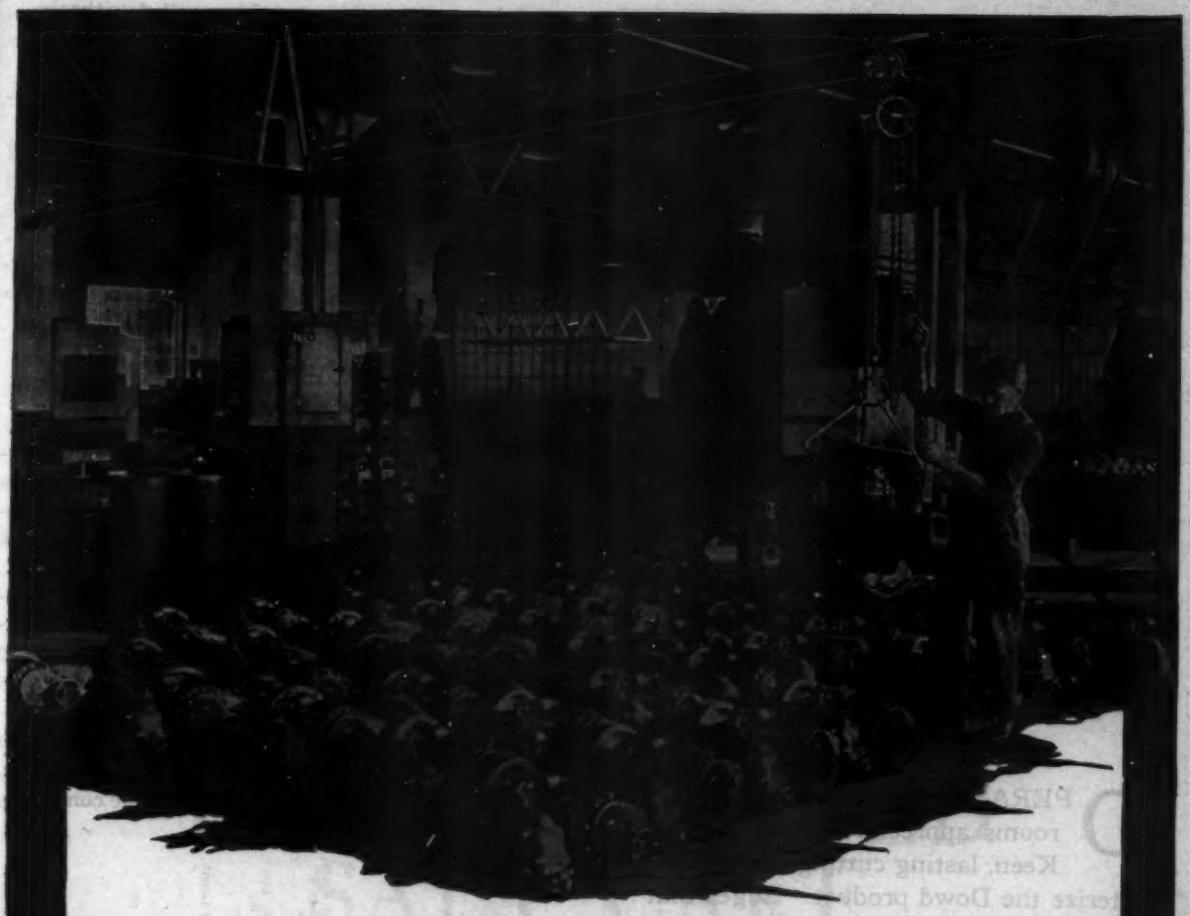


Figure 2

(13) and supported beneath by a second felt (20) which also passes between the press rolls and supports the web around the guide roll (14), and thence, on its return, through the washing tank (17). The press felt carries the web over roll (15) which is placed above the first drying cylinder, and thence over the roll (16), supported so that the felt is held in contact with the drying cylinder with a substantial



A One-Man Hoisting and Conveying System

THIS busy plant found that it was too expensive to use a gang of men every time it was necessary to move a heavy casting or a completed engine.

With a complete "C-M" hoisting and conveying system consisting of "Cyclone" Hoists, C-M "Matchless" Trolleys and "C-M" 3-way Switches it was found that one man could do the work that formerly required a good-sized gang. The installation is paying big dividends.

When you consider that such a system will load or unload cars, pile stock, feed machines, assemble heavy machinery and do a hundred and one other similar jobs, you begin to get an idea of its profit-making possibilities.

A complete catalog of "C-M" Hoisting and Conveying equipment sent on request.

The Chisholm-Moore Mfg. Co.
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Canadian Representatives: Pulp & Paper Mill Accessories, Ltd., Shaughnessy Bldg., Montreal.

arc, and constitutes a smoothing roll for the web. The return of the felt then passes through the washing tank (17) and the wringer rolls (18).

This same arrangement can be applied to a cylinder machine as shown in figure 2.

The particular advantage of this arrangement of felts is the continued support they give the web from the time it leaves the couch roll or cylinder until it is well around the first drying cylinder, and the possibilities of higher speed are consequently quite apparent. The construction also permits the continuous washing of the felts.

Tearing Strength of Paper

That there is no relation between the actual tearing strength or toughness of paper and the values obtained with the commonly-used paper testers is indicated by the results of recent experiments at the Forest Products Laboratory. The method of test, employing a Schopper tensile strength tester, demonstrated that the toughness of paper can be numerically measured, but that the pop test, breaking length, percentage stretch, and number of folds give very little information about this property.

The following table gives the tearing strength of various papers in grams as determined by the laboratory method and the values obtained in the commonly used tests:

Kind of Paper	Weight of Ream, 24x36, Lbs.	Pop Test, Lbs. per Sq. In.	Breaking Length, Meters.	Stretch, per Cent.	Folds, No.	Tearing Strength, Grams.
News sheet	28	8	2915	1.0	1	17
Steamed groundwood (brittle)	34	14	4584	1.5	5	21
Tough kraft (soft feel)	41	44	6670	3.6	3020	80
Hard kraft (tinny feel)	52	38	5320	5.0	556	73
Litho (bleached sulphate)	44	25	4860	2.9	248	83
Bond (all rag)	38	37	5363	5.31	798	88
Ledger (all rag)	87	110	6335	6.1	2436	167

Acid Control

A system for controlling the making of sulphurous acid has been perfected and is now in use in several mills in the United States and Canada. It is possible to set the apparatus for a certain percentage of free SO_2, and this point will be maintained automatically and unfailingly, and while obtaining this result, also affects great savings in many ways.

The equipment necessary to affect a control on any one acid making unit must be made special, which necessitates making tests of acid and other tests before this work can be started; also a great deal of care has to be taken in the installation of the equipment to insure good results.

The equipment necessary consists of an instrument for measuring the conductivity of the acid, the current being furnished from an alternating current line carried into the liquor by the use of electrodes. The

Silicate of Soda

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Cylinder Covers and Other
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Collinwood Station CLEVELAND OHIO

instrument is set in series with this line, and by means of a regulating device, it is possible to set this instrument for the desired strength of acid. It is claimed that this instrument is so sensitive that a variation in temperature and other items do not have a chance to hamper the control.

It is claimed that by the use of this equipment, great savings are affected in the way of materials and labor, and that in some instances the capacity of the acid plants have been increased a great deal. In one case, the output of a sulphite mill is said to have been increased 9 1-16 per cent.

The motor driven valve is set in the line of the modifying solution (in the milk of lime in the milk of lime system, and in the water line in the tower system) and the amount of modifying solution entering the system depends upon the amount of free SO_2 in the raw acid.

The system is believed to be what has been needed for a long time to satisfactorily help to run sulphurous acid plants.

Cooking Sulphite Pulp

(*Continued from page* 1145)

another cooler into the reclaiming tank, piping both lines to the bottom of the tank. My raw acid runs to this tank by gravity, entering it 2′ below top of tank. The gas going into this tank continually agitates the entire body of acid in it, and whatever excessive gas is not taken up by the acid in tank rises to the surface and is sucked from there to the push fan, and then pushed into the acid towers. When we first tried this I had a 2″ lead line attached to the top of the acid tank to lead surplus gas to towers, but this was not satisfactory, so we installed a 4″ hard lead line in place of the 2″ and the results were wonderful, as it increased the capacity of the acid plant from 32 tons to 39 tons. The main point here being to keep the reclaimer and acid system closed tight, so that there is no loss of gas, and to avoid admitting air to the system.

On the wood towers system, we used two towers 123′ high, and 4′ 10″ in diameter; also one extra tower for a reclaimer. On the new system, we use two towers 5′ 6″ diameter, and 75′ high. These also made a decided improvement on the appearance of the mill property.

The result of all this was a reduction of sulphur from 310 lbs. to 274 lbs. per ton of sulphite made; also a bigger production. No time is lost in charging towers with stone, as we keep right on making acid during this time. The charging is done by two men every other day. We also eliminate the service of a repair man, who was constantly needed on the old system.

In regard to the consumption of sulphur, I often hear that some mills are only using 240 lbs. sulphur per ton of sulphite made. While it is claimed that

Continuous Beating

More uniform stock, the power bill cut in two, only one-half of the floor space needed in your beater room and many other advantages follow the installation of a Bird Continuous Beating Attachment.

The cost of power saved alone will pay for the installation six times every twelve months.

These are not claims but facts proved in actual operation.

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this can be done, I have my serious doubts about it; but, I will admit that it might be done, if we have a perfect system of reclamation; but how many of us have that? Is your reclaiming tank air tight? Is your system and cooler free from air leaks? Have you enough cooling surface? Have you any sulphuric acid trouble or sublimation, and have you got the proper combustion? All these will tend to reduce the quantity of sulphur, and give you more and better acid. I know that my own system can be improved upon, which I am going to undertake in the near future.

Dry Gas Needed for Quick Cooking

I also found that limestone containing a high percentage of calcium was necessary to make a good acid. Of course, it is understood that every one makes his acid to conform with his way of cooking digesters. As the tonnage of our sulphite mills is rather low to supply the paper mill end, I am forced to do quick cooking, thereby increasing my own tonnage, and in order to do this, the acid must contain a high gas. You can readily see that the acid plant cannot do this alone without the help of a good dry gas return from digester to reclaimer. So if you want to cook a digester in five hours, you must necessarily draw off your liquor from it as scon as possible in order to get dry gas. This helps to strengthen the acid in reclaimer, and consequently you can run your raw acid weaker, giving you a larger production, and also a reduction on the amount of sulphur used per ton. As you all know the chemical process in making acid, I will only add that my average cooking acid in the reclaimer test is as follows:

Total	473
Free	352
Combined	121

hydrometer 6, temperature 85 degrees Fahrenheit.

You will notice that I keep my reclaiming acid warm, because, in this way, it is slightly preheated when it reaches the digester, all of which helps in raising a digester to pressure quickly, remembering that all surplus gas in reclaimer goes back to acid tower, where it is absorbed.

I have heard arguments against this method of fast cooking, some claiming that the yield per digester is reduced thereby through chippy stock, and also a poor fiber. I found in actual operation that I increased the production per digester from 400 to 700 lbs., and I also had a very long and strong fiber. I believe that the quicker you cook your digester, the less water you receive into your digester through condensation of steam, so the longer you send steam into it, the more the water in the steam will effect the strength of the acid.

Here is an exact report of a digester cooked in 5 hours, although we have cooked them in 4 hours and 25 minutes, with a combined as low as 96.

Thirty Miles of Graves in 1919

Thirty miles of graves were filled with the dead from industrial and public accidents in the United States during 1919—eighty thousand men, women, and children sacrificed without cause. Such a condition demands serious attention—especially when it is realized that over 75 per cent of these deaths were preventable.

The story of 1919 is only a repetition of preceding years. It is this annual wastage of human beings and the resultant heavy cost to industry that has called into existence the National Safety Council, a purely co-operative, non-profit making association of nearly 4,000 of the largest industrial concerns in the country—created primarily because organized accident prevention in industry had become an absolute essential.

At its headquarters the Council maintains the most complete accident prevention library in the world. Its service to members includes a weekly unit of educational poster material; a monthly publication of safe methods in industrial operation and processes; the preparation of lessons for schools for foremen, chauffeurs, and safety inspectors; and the maintenance of a consulting department through its staff of engineers.

Here is a service which cannot be bought. As a member, you help to enlarge the scope of the Council's effort, and in return you receive all of the benefits which accrue from its activities.

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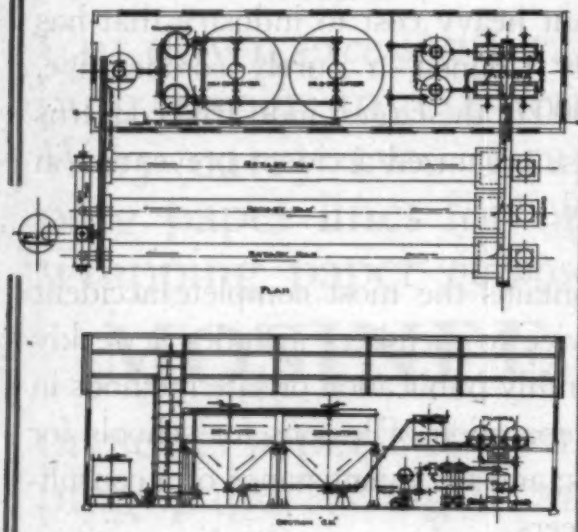
CO-OPERATIVE NON-COMMERCIAL

168 North Michigan Avenue, Chicago, Ill.

Continuous Causticizing with Lime Recovery and Reuse

OUR apparatus is built for the specific purposes indicated in the above title. It is the work of our consulting engineer, who for nearly twenty-five years was general manager and chief designing engineer of one of the large alkali plants in this country. The apparatus has been in successful operation for some seven years, and is highly efficient, both as regards economy in the use of raw material, and saving in labor.

The complete plant which we furnish, consists, as indicated in the sketch, of a continuous causticizer, decanter, rotary filter, rotary kiln, gas producer, lime slaker and auxiliary apparatus such as vacuum pump, lime and liquor pumps and sludge agitator. All apparatus work continuously. The causticizer is heated with exhaust steam, and supplied continuously, by means of pumps, with calcium hydrate and sodium



carbonate in the proper proportions. The continuous discharge of caustic liquor and lime sludge is delivered by pumps to the decanters, the clear caustic drawn from the top and the mud from the bottom; delivered by pump direct to the sludge agitator from whence it flows to the filters. The dried filter cake is delivered by belt to rotary kilns fired with gas, from whence the recovered lime is returned to the slaker to be used again.

With good grade of lime, 90% of the sludge can be recovered. The alkali loss is with careful working, almost nil. All of the apparatus is of heavy construction, and specially designed for the work. The process being continuous the steam consumption is much less than that of the batch process, moreover the process does not require live steam, exhaust at 10 pounds pressure being ample to operate at maximum capacity.

Glamorgan Pipe & Foundry Co.

Lynchburg, Va., U. S. A.

Digester charged at 9:45.

At 10:45 Digester pressure 80 lbs. temperature.

11:45 Digester pressure 80 lbs., temperature, 270 degrees Fahrenheit.

12:45 Digester pressure 80 lbs., temperature 300 degrees Fahrenheit.

1:45 Digester pressure 80 lbs., temperature, 314 degrees Fahrenheit.

2:45 Digester pressure 80 lbs., temperature 320 degrees Fahrenheit.

Digester discharged at 2:45; liquor test on iodine, 3; time cooked, 5 hours; stock, white fiber, tough and long.

In cooking this way, care must be taken when cook is nearly done, to avoid burning of stock. In this manner, the chips are dissolved just enough to leave a uniform long fiber.

In summer time at our plant, I am often called upon to cook "dead heads," which is a log that is water soaked, and has gone to the bottom of the river. In cooking these, we strengthen our acid, so as to get a combined of 132, with which we cook the chips 7½ to 8 hours. Of course, in this case, we get more screenings than in dry wood. I try to hold the temperature of the combustion chamber as near 600 degrees centigrade as possible. I also find that by having the sulphur gas after leaving cooler test 17% I get the best results. I am somewhat handicapped in summer time on my acid cooler, as we have no cold water, using river water, but by frequently slushing the cooler, I manage to do fairly well.

In regard to the digesters, of which we have two 2½-ton and one 5-ton, I use a side and top relief on the large one, and top relief only on the small ones.

This is my first attempt to write an article for our official organ, The Paper Industry, and I trust it will be taken as it is meant. I also hope this will start something with some of the others, for after all it is only by others criticizing our way of doing things that we can make the other fellow tell us a better way.

Keeping Air and Water Out of Dryers

(*Continued from page* 1150)

in the dryer to force the water out of the syphon pipe against the static head. In other words, water cannot be syphoned out of the dryer when the same pressure is maintained on the return header, until the dryer first fills with water to the center and starts the syphon. Then only are the dryers entirely emptied, which causes the uneven drying conditions. These uneven conditions are verified by the uneven slugs of water coming from the paper machine, which is drained by one or more traps connected to the one common return line header.

The cut, Figure 2, shows the old or the most common way of piping up dryers with a trap draining the

CRANETILT STEAM TRAPS SAVE COAL IN PAPER MILLS

DIRECT RETURN TRAP
Made in sizes ½ to 4 inch, capacities up to 28,000 pounds of water discharged an hour.

These machines are very rigid and practically indestructible. They have no internal working parts. All discharging openings are equal to or higher than the pipe connections and all valves and seats are easily removable and renewable.

NON-RETURN TRAP
Made in sizes ¼ to 3 inch, capacities up to 112,500 pounds of water discharged an hour.

Buy Steam Traps on their discharging capacities—not by pipe sizes.

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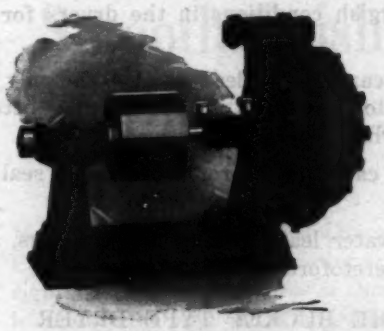
Centrifugal Pumps

BELT OR MOTOR DRIVEN



Extra wide ring oiled bearings. Overhanging casing allowing the discharge to be taken at any angle desired. Removable outer head so that impeller may be withdrawn without disturbing the casing. Hydraulically balanced impeller insuring minimum end thrust. Impeller machined all over and turned to make a close running fit with the casing.

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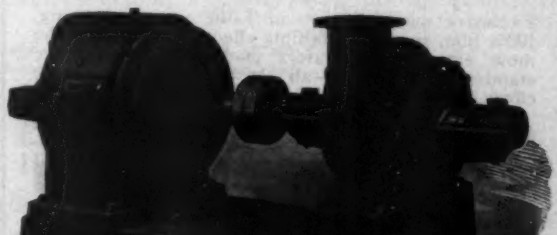

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WHEELER
Wheeler Condenser & Engineering Co.
CARTERET, N. J.

No. 76

main return line header. The water in this trap, necessary to raise the float or bucket, forms a seal and prevents getting the air out of the dryers of the paper machine, other than what might leak out through defective packing, or poorly packed stuffing boxes of the dryers.

With the piping and stuffing boxes tight, as they

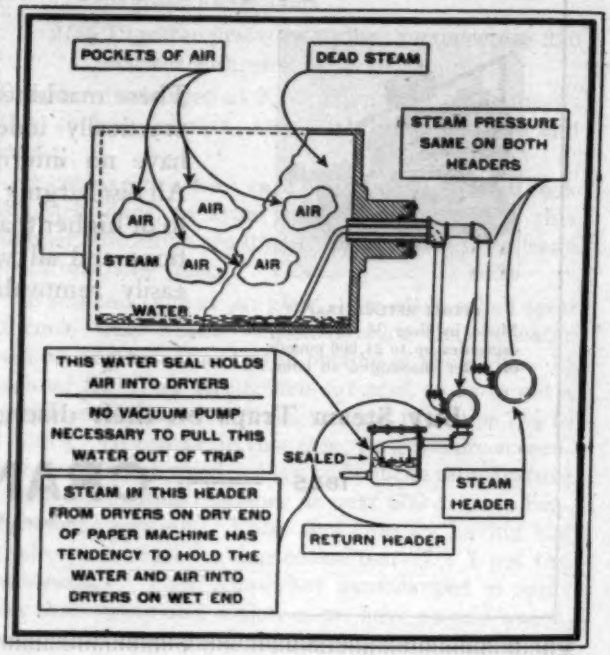
POCKETS OF AIR
DEAD STEAM
STEAM PRESSURE SAME ON BOTH HEADERS
AIR
AIR
AIR
STEAM
AIR
AIR
WATER
THIS WATER SEAL HOLDS AIR INTO DRYERS
NO VACUUM PUMP NECESSARY TO PULL THIS WATER OUT OF TRAP
SEALED
STEAM HEADER
STEAM IN THIS HEADER FROM DRYERS ON DRY END OF PAPER MACHINE HAS TENDENCY TO HOLD THE WATER AND AIR INTO DRYERS ON WET END
RETURN HEADER

Figure 2

should be, the seal of water in this trap draining the header with this type of job shown in Figure 2, there will be sluggish conditions in the dryers for three reasons:

1. The steam stands dead because the only steam admitted into the dryers is that which is necessary to replace what has been condensed.

2. No air can escape through the water seal in the trap.

3. The water leaves the dryers in slugs, as ex-explained heretofore.

THE BUCKET TYPE DRYER

If the dryers are equipped with buckets instead of syphons, and a trap of any type is used to drain the main return line header as shown in Figure 2, the air will remain in the dryers due to the seal of water in the trap, and, also, water is not relieved freely from the dryers, because with the same pressure on the return line header as on the steam header, the water flows out of the dryer due to the static head only. There is no pressure difference to increase this velocity, for the same reason as explained heretofore, that the pressure on the return line header has been

Eight seven-retort Riley Underfeed Stokers as installed under 600 horsepower B. & W. Boilers. Note the cleanliness of the boiler room and the absence of all operating mechanism underneath the stoker.

Riley Stokers Give You Higher Efficiency and Lower Maintenance

The **average efficiency** the first year after installing Riley Stokers at this plant was 72%—the maintenance $0.0035 per ton of coal fired.

RILEY UNDERFEED STOKERS

Such results have a meaning so significant that no engineer can safely disregard them. The results are not unusual but are typical of Riley Service. They are directly traceable to the three unique Riley features—**the moving grates—the continuous automatic ash discharge—the safety connecting rod.** These valuable features are fully described in our catalogue D-3.

Sanford Riley Stoker Co.

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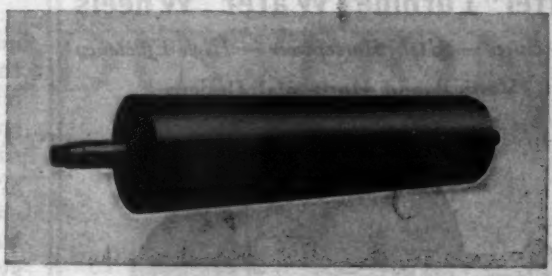

Means much toward the economical and successful operation of your Paper Drying Machines. U. S. Cast Iron cylinder rolls are cast vertically, thereby insuring a uniform wall thickness with no unsightly seams, floating cores or chaplets—the slag rises to the top of the mold and is machined so as to leave only the pure and homogeneous metal—the result—a smooth finished casting of high quality.

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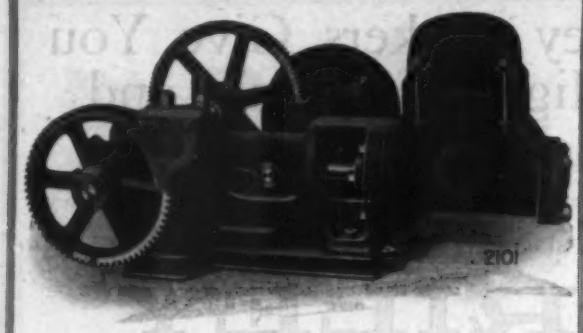

WE CAN furnish this pump equipped to handle any liquid that will flow through a pipe. The wearing parts are all liberally proportioned for the service required. All valves are above the piston and easily accessible by the removal of the water chest cover.

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Leffel Turbine Water Wheels

High Speed — High Horsepower — High Efficiency

Vertical and Horizontal Designs

Large Horizontal Direct Connected Unit

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H. H. White, 1303 Fourth Nat'l Bank Bldg., Atlanta, Ga.
William Hamilton Co., Ltd., Peterboro, Ont., Canada.

built up through the dryers on the dry end of the paper machine.

Why Individual Trap System Is the Wrong Way

A dryer equipped with a small trap is shown in Figure 3. Note the seal of water in the trap necessary to lift the float or bucket. With this construction, there is sure to be the same pressure on the syphon pipe up to the trap, as is on the steam header. With the same pressure on each of these pipes, it is

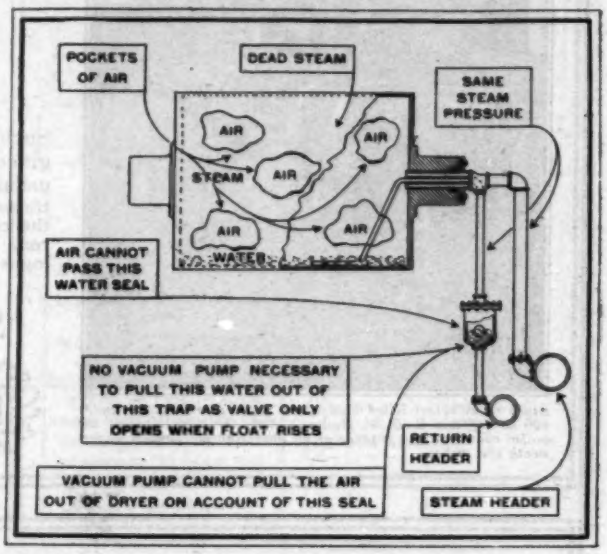

Figure 3

quite impossible to get a free flow of water up through the syphon pipe, for the reason that water must accumulate in the bottom of the dryer until the end of the syhon pipe is sealed, then when the pressure has reduced sufficient between the end of the syphon pipe and the trap to cause the proper differential, and with sufficient pressure on the dryer, water cannot be forced out of the dryer with this system.

It is absolutely impossible to get any air out of the dryers owing to the seal of water in the small trap. Furthermore, there is the disadvantage of maintenance of a number of small traps, and the possibility of leakage of steam through these small traps.

Many paper mills are using a vacuum pump to drain the water from these small traps, while in the majority of cases the water would flow from the trap by gravity. Some paper mills have the opinion that the vacuum pump attached to the small traps effects a vacuum in the dryers. This could not be done, because, first of all, a vacuum pump will not pull a vacuum when any vapor is coming through, and, secondly, the seal of water in the small trap to raise the float control to open the valve absolutely prevents any vacuum within the dryer, or in other words, is a tightly closed valve between the paper machine dryer

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Brass, Copper and Iron Cloth

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WIRE SIGNS

Cheney Bigelow Wire Works

Established 1842 SPRINGFIELD, MASS.

YOUR PRODUCTION!

$$P = \frac{WTS}{600} - B$$

P=Production of salable paper in lbs. per hour.
W=Weight in lbs. of one ream (24 x 36-500).
T=Trim of paper in inches.
S=Speed of machine in feet per minute.
B=Lbs. per hour of paper lost in breaks or made unfit for sale.

Of the factors in the above formula by which you can determine YOUR production, T and W are fixed at predetermined values. But the values of S and B are variable and depend upon the equipment of the machine. Suction Rolls increase S and almost entirely eliminate B. The value of P then becomes much greater. Isn't that what YOU desire?

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Every Standard Grade of

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Philadelphia Office: 1416 Wood St.

and the vacuum pump, only opened as sufficient water rises in the small trap to operate the float that opens the valve.

Furthermore, in most cases where a vacuum pump is used, a cold water spray is used in the suction line to cool down the high temperature condensate discharged from the small traps. This condensing spray is what creates a vacuum in the majority of cases rather than the vacuum pump, and the enormous amount of cold water used cools down the condensate and causes a big waste of heat, thus a loss in fuel.

With the above mentioned systems, a higher back pressure on the engines, and some additional live steam is usually necessary to get the required temperature and yet does not produce the desired results.

Colloidal Chemistry as Applied to the Paper Industry

(*Continued from page* 1141)

(alum) are first mixed and then added to the pulp, most of the colloid material will be destroyed, and the paper resulting will merely be a mechanical mixture of the precipitated size and the pulp.

As a rule, the highest grade of paper will result when the size is properly precipitated on the pulp, as in this manner a more uniform mixture will be secured and the size will be more effective. However, in order to accomplish this result, full consideration must be given to the colloidal properties of all of the materials. Without taking these factors into account, the attempt to precipitate the colloidal size is likely to be unsatisfactory. It should, of course, be kept in mind that practical operating considerations are frequently of more importance in an individual case than a refinement of technical theory.

The subject of cleaning waste water from paper mills is at times an important problem. The impurities in the water, which necessitate cleaning, are usually largely colloidal, and the method of removing them, therefore, involves considerations of colloidal chemistry. Fundamentally, therefore, cleaning consists in a precipitation of the colloids, and, as has been previously pointed out, this may be accomplished by adding oppositely charged colloids, by variations in temperature, by the addition of electrolites.

The subject of fillers is also closely connected with colloidal chemistry. The best fillers are colloidal, and, as a rule, the ease with which they may be handled depends upon the degree of dispersion. For this reason, it is frequently possible to materially improve the mechanical handling of a filler by increasing its dispersion.

The nature and size of the charge carried on the colloidal particles of the filler is important in controlling its action with regard to the cellulose fibers. Those fillers which add most to the value of the paper may usually be shown to have a charge opposite in sign to that carried by the body of the paper, thus causing the filler to adhere most firmly and to be most

THE SCOOP CONVEYOR

A Convenient and Flexible Machine for Loading, Unloading or Transferring Coal, Coke, Ashes, Sand, Earth, Gravel or Similar Materials.

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Uniform Quality
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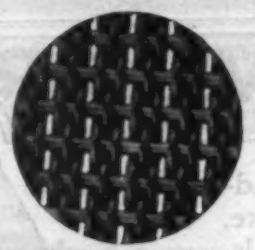
TYLER

Triple Warp Fourdrinier Wire



Triple Warp Fourdrinier Wire, Magnified Section

TYLER

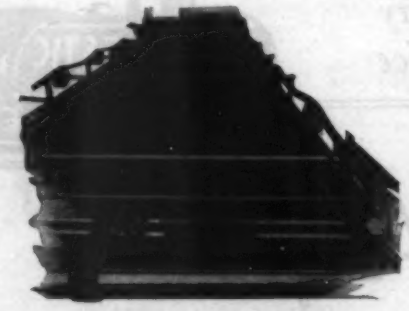
Triple Warp Fourdrinier Wires

The Tyler Triple Warp Fourdrinier Wires are made from phosphor bronze wire and are used for making finer grades of light weight paper, such as carbon, cigarette, high grade tissue, India and Bible papers, and other specialties.

As illustrated above, these wires are woven with a triple warp and a single shoot wire.

The triple warp wires can be woven to fit any paper-making machine, but are generally used on the smaller machines.

Prompt deliveries can be made on all meshes of Tyler Fourdrinier, Cylinder and Washer Wires. In many instances shipment can be made from stock, including the Tyler Special Wires and the regular No. 60, 65, 70, 75 and 80 Wires.



The W. S. Tyler Company

Cleveland, Ohio

Manufacturers of Fourdrinier Wires, Cylinder Faces, Washer Wires, Corduroy Cloth, Backing Wires

unfirmly distributed. It should not be assumed, however, that all fillers are colloidal, as in many cases they are simply mechanical mixtures with the pulp. Some laboratory experiments have demonstrated the possibility of building a group of fillers around each cellulose fiber, which result in an unusually opaque and high-grade paper.

The above discussion has, of necessity, been somewhat brief and has dealt with general considerations rather than with specific examples. It is hoped, however, that the very large field of practical applied colloidal chemistry has been indicated.

Many of the results which occur in the paper industry are, of course, purely matters of ordinary chemical reactions, and as such may be readily understood. There are, however, many apparently contradictory and confusing results, which, as the practical man will realize, cannot be explained by the ordinary chemical formula. The frequent case in which two different plants will apparently follow the same procedure and secure radically different results, both in quality and cost, are illustrations of those reactions which may frequently be interpreted by the principles of colloidal chemistry. If the writer has succeeded in pointing out even a small portion of the very large field of colloidal chemistry, he will feel repaid for this somewhat incomplete paper.

Finishing Room Management

(*Continued from page* 1124)

finishing room's equipment recently is to be found in the automatic platform truck. One of these handy implements and an adequate supply of platforms will do the same service as the equal amount of four-wheeled trucks, besides only taking up a fraction of the space the trucks would occupy, as the platforms, when not in use, can be stacked ten or twelve high.

Care exercised by the machine room help in turning out evenly calendered and nicely wound rolls, will greatly add to the efficiency of the cutter's and finisher's work. The same holds good in regard to the work done by the super calender help.

Special attention should be paid to the condition of slitters and knives on the cutters, keeping them sharp, so as to leave the paper edges clean and free from dust, thus eliminating many a chance for a complaint on the pressman's part.

Neatly sealed and labeled packages, substantially tied bundles, solidly nailed—and for export—well banded cases, will always be found of value to a mill in disposing of their product.

Clean and sanitary working conditions, airy and well lighted work rooms, sufficiently heated in cold weather, separate lockers, and a plentiful supply of cold, pure drinking water will be found of great benefit in keeping the help contented and causing them to do efficient work.

OXFORD PAPER CO.

Mills at
RUMFORD, MAINE

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The Symbol of Quality

The Symbol of Quality

LAKESIDE PAPER COMPANY
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"Our name stands for Quality"

We are manufacturers of Bonds, Bible, Book, Catalogue, Eggshell, English Finish Opacity, M. F. and S. & S. C. French, Myriad Manifold, Tiffany Bond, Glazed, Unglazed, and Embossed, Gaza Onionskin, R. R. Writing, Writing Manila, High Cliff Mimeograph, White and Colored Laid Flats. Also other light and heavy weight M. F. and S. & S. C. specialties.

Quality and Service

From a Jobber:

"We are enclosing an order for two additional cars and think it would be well to add that your paper has been running very satisfactory and that it will probably be some little satisfaction to you to know that we are thoroughly satisfied with this sheet and think it well to give you a word of praise."

THE PRODUCTS OF INDIVIDUALITY

"Some" Papers to be all three!
GOOD Papers
BETTER Wet than Dry
BEST Brands
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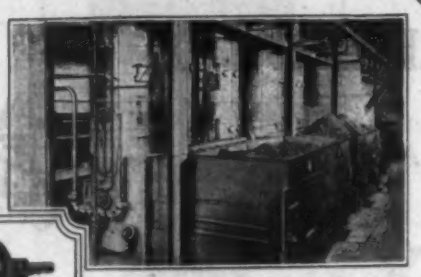
KVP Vegetable Parchment is a GOOD, strong, pure paper for wrapping and packing foods and other products—BETTER wet than dry—the BEST in the world for its purpose.
KALAMAZOO VEGETABLE PARCHMENT COMPANY
KALAMAZOO, MICHIGAN
"World's Model Paper Mill"
Makers of Vegetable Parchment and Waxed Paper



Can Any Evidence Be More Convincing Than Repeat Orders?

REPEAT orders are the highest expression of Confidence. It is significant that today eighteen years after their manufacture began, over 60 per cent of all Diamond Soot Blowers' business consists of re-orders from former purchasers.

Every American Industry of any prominence contains many representative members who almost invariably purchase Diamond equipment whenever they put in additional mechanical soot blowers. To mention a few prominent purchasers:

	Number of Orders	Number of Boilers Equipped
General Electric Company	26	60
Ford Motor Company	12	28
Solvay Process Company	15	53
Brooklyn Edison Company	16	56
Armour & Company	16	53
General Motors Company	12	34
Du Pont Powder Company	22	115

These seven concerns within a period of a few years placed 119 orders to equip a total of 399 boilers. There is nothing casual or accidental in this record. The marked superiority in design and construction of Diamond equipment—the high and uniform quality of the service rendered—and the notable savings effected in fuel and labor are the underlying causes of these large purchases just as they are the foundation of the largest soot blower business in the world.

If your boilers are not equipped with Diamonds ask for Bulletin 290.

DIAMOND POWER SPECIALTY COMPANY
Detroit, Michigan

Diamond

SOOT BLOWERS - SAVE 4 to 8% FUEL

From 40 to 3,800 Members in Six Years

(*Continued from page* 1148)

1,500 blue prints and photographs, all devoted to safety or allied subjects.

Schools for Foremen and Safety Supervisors

The most successful feature of the Local Council work has been the development of schools for safety supervisors. Many companies desire to select safety inspectors from among their own employees. The schools conducted by the various locals of the National Safety Council offer an opportunity for the training of such men.

The co-operative spirit that has made the National Safety Council possible, is, perhaps, best demonstrated at the Annual Safety Congresses, where three or four thousand men and women meet to hear addresses prepared by 150 or more speakers, and to participate in round-table discussions on every phase of safety.

The National Safety Council, starting as an association of a hand full of manufacturers, has in six years come to be one great organization, leading the movement, not only for accident prevention and industrial betterment, but also the movement for public and educational safety in this country.

The Nigger in the Coal Pile

(*Continued from page* 1126)

of the number of men formerly employed. No change has been made in the management.

One Cause of the Car Shortage

The hundreds of large plants which are consuming fuel wastefully, in many cases more wastefully and carelessly than ever before, are directly and needlessly causing a large fraction of the existing car shortage.

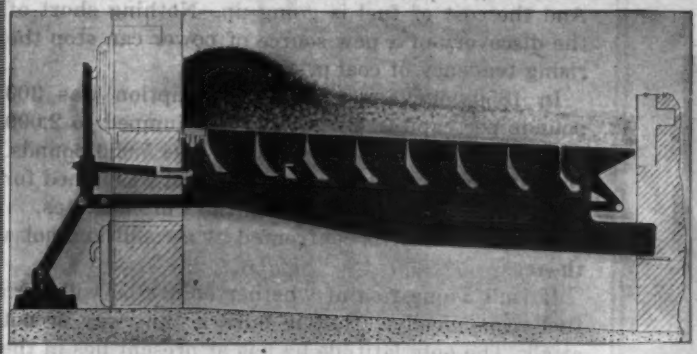
The saving or wasting of 25 per cent of the coal consumption of any industrial plant, and the saving of 10 to 25 per cent of the coal consumption of any central station depends entirely upon the efficiency of its operating management. This percentage of saving relates exclusively to the boiler plant, to the production of steam, and does not include the large economies possible in connection with its distribution and use.

I refer to the boiler plant, particularly, because it offers the more lucrative field for producing economies, and these with a minimum of alteration in physical equipment.

Under present conditions, a plant which carelessly operates at an efficiency of 40 to 50 per cent, receives from the government the same consideration in the delivery of coal as the one whose efficiency is 70 to 75 per cent. An awakened America will certainly not permit this condition to continue.

What Is Coming

Power is one of the largest items of expense in the manufacturing business, and the cost of fuel repre-



CARRIGAN Hand Stoker saves 10 to 25% of your fuel

Can be installed in any boiler setting without changing the brick work. Is practically smokeless and disposes of the ash and clinker mechanically. Does the work of the rake, poker and slicebar mechanically. Burns any grade of coal. Costs one-third to one-sixth of automatic stoker.

CARRIGAN ENGINEERING
CONSULTING AND SALES ENGINEERING
CUNARD BUILDING, CHICAGO, ILLINOIS

Save 50—75% on Ash Handling

You can cut your ash handling costs 50 to 75% if you will install in your boiler plant one of our

AMERICAN
STEAM ASH CONVEYORS

The equipment soon pays for itself and goes on earning a substantial dividend. Designed to meet the individuality of your boiler room. Basic Patents.

Engineering details found in catalogue P. Write today

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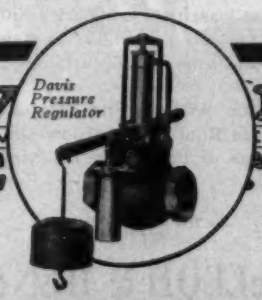
STEAM SAVERS SINCE 1875

Paper Mill Necessities—

DAVIS VALVE SPECIALTIES are invaluable in paper mills; where power plays a chief part. They include pressure regulators for steam, air and water, steam traps, balanced valves and other valuable steam savers—all tested by daily use in hundreds of power plants for almost a half century. Every paper man should write the G. M. Davis Regulator Co., 414 Milwaukee Ave., Chicago, for a free copy of the extensive Davis catalog. Branches in principal cities.



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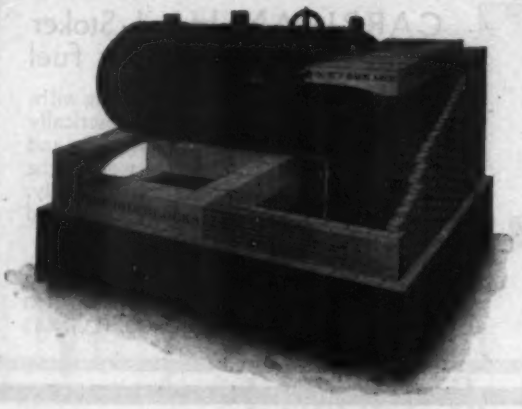
WE-FU-GO AND SCAIFE WATER

PURIFICATION SYSTEMS
SOFTENING & FILTRATION
FOR BOILER FEED AND
ALL INDUSTRIAL USES

WM. B. SCAIFE & SONS CO., PITTSBURGH, PA.



Avoid Shut-Downs

Caused by Boiler Setting Failures

It is just as easy to have a boiler setting that will give the maximum service with a minimum of repairs as to have one that constantly requires patching and occasionally causes a complete lay-off.

"STEEL MIXTURE"

BOILER SETTINGS

will outwear at least two small brick linings and will save money as well as trouble occasioned by the maintenance and renewal of settings.

Made for Door Arches, Fire Box Linings, Back Arches, Furnace Roof Arches, Blow-Off Pipe Protectors. Any type of boiler can be fitted up without delay.

Send the coupon.

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Gentlemen:

Please send us complete information about the "Steel Mixture" boiler settings, with reference particularly

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sents on the average 70 per cent of the cost of power. And the cost of fuel is going up. Nothing short of the discovery of a new source of power can stop the rising tendency of coal prices.

In 1850, our annual coal consumption was 300 pounds per capita. By 1870 it had jumped to 2,000 pounds, and twenty years later it was 5,000 pounds. In 1919, approximately six tons of coal was mined for every man, woman and child in the United States.

The power user is confronted by a condition, not a theory.

It isn't a question of whether or not he will burn fuel economically. He will burn it that way or not at all. The only latitude he has at present lies in the question "When?" and the rope is getting shorter every day.

The time is coming when the conservation of fuel will be rightfully and generally conceded to be a public, national matter, and the use and waste of fuel subject to regulation. Almost inevitably a state or national commission will require from users a strict accounting of their stewardship of the B. t. u. entrusted to them from the nation's great storehouse; whether two, five or ten times the necessary amount is being used; not whether the individual is satisfied or chooses to waste, but rather the broader view of conservation that with waste the cost of fuel is made proportionately greater, more burdensome to others.

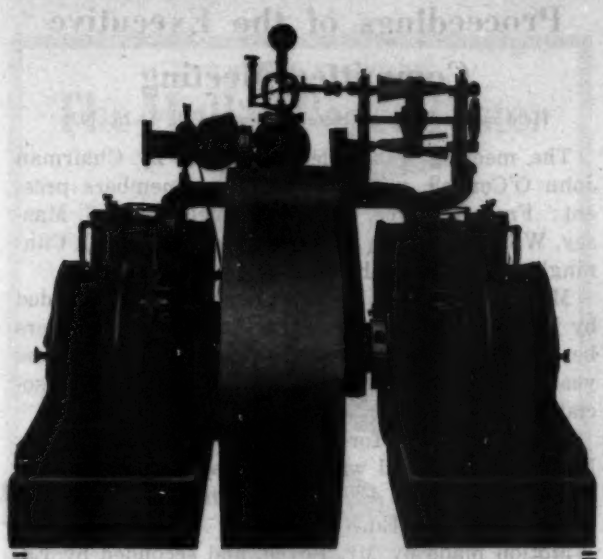
"Priority"

The Eastern Manufacturing Company of Bangor, Maine, has respectfully called attention to the statement which was made in the article, "Developments of the Year in Trade-Marking of Paper and Pulp Products," by Waldon Fawcett, published in the February number.

"Of the newly-enrolled names that embody the suggestive or inspirational element in the subtle form, there may be instanced 'Priority' and 'Commission,' that have lately been pre-empted for use on writing and printing paper by the American Writing Paper Company of Holyoke, Mass." The Eastern Manufacturing Company claim that this mark had been registered by them on February 11, 1919. They also call attention to another discrepancy in the same article, where Miller and Wright Paper Company is mentioned in error as being the predecessors of the Eastern Manufacturing Company.

Paper a Barometer

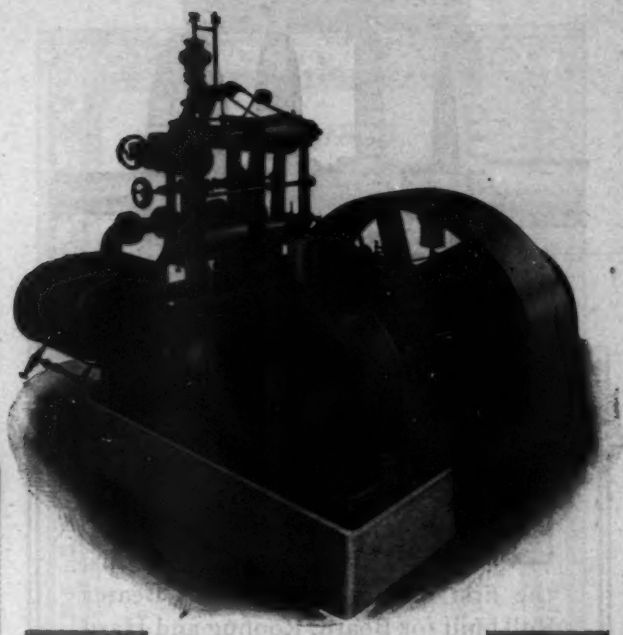
It is confidently alleged that writing paper consumption is an accurate barometer of the general business conditions, as good as anything else. Iron has long held leadership, but now paper is surely substantially recognized.—Honolulu Item.



THE BALL VARIABLE SPEED ENGINE

solves the problem of your variable speed drive. Its reliability results in maximum production. That's why *one in every three of these engines is a repeat order.*

Ball Engine Co., Erie, Pa.



Variable Speed Engine

The engine illustrated above is especially designed to drive paper machines, giving continuous and reliable service. A patented safety device protects your employees and plant.

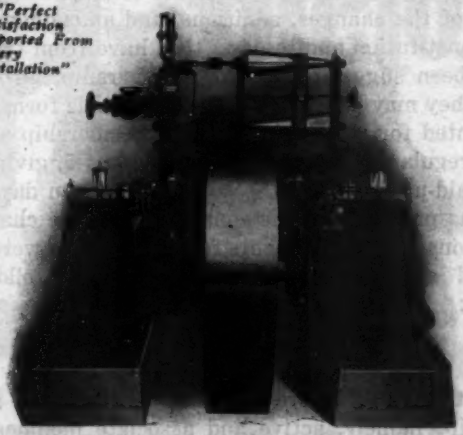
THE BROWNELL CO., Dayton, Ohio

SEND FOR BULLETIN E-4

Large, Modern Designed

ENGINES

"Perfect Satisfaction Reported From Every Installation"



Economy—Continuity of Performance—Ease of Care and Adjustment—Infrequency of Repairs

These, the important requirements of an engine, are met by "ERIE" double variable speed engines.

To the Paper Mill Trade

We will be glad to furnish full information as to price, delivery and equipment to meet your requirements, and will appreciate an opportunity to furnish these details by mail and the privilege of personal interviews being arranged.

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ERIE ENGINE WORKS *Established 40 Years* **Erie, Pa.**

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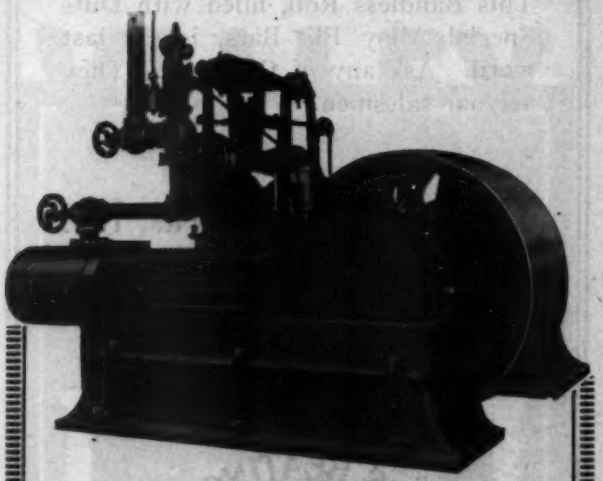

Variable and Constant SPEED ENGINES

Paper Mill Economy is assisted very materially by the installation of High Grade Variable Speed and Constant Speed Engines.

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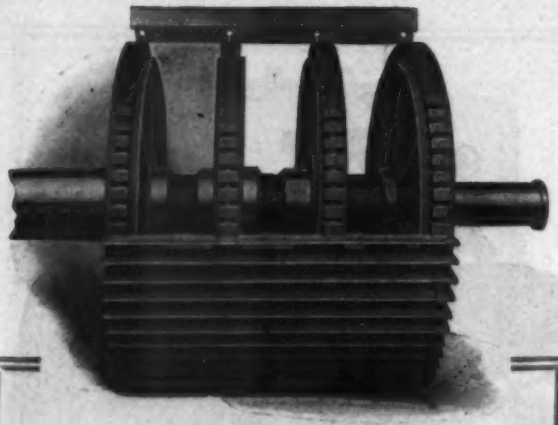

NEARLY 400 Dilts Bandless Beater Rolls, now in service, attest daily to the value of this, the first and only successful Beater Roll built for Board, Roofing and Hard Fibre. Why not profit by others' experiences and install it **now** rather than change to it **later** after loss and expense with the old type of banded rolls?

This Bandless Roll, filled with Dilts Special Alloy Fly Bars, is the **last word.** Ask any of the users. They are our salesmen.

Dilts Machine Works, Inc.

Fulton, N. Y.

Manufacturers of

Beating and Washing Engines
Agitators, Fly Bars, Bed Plates
Rag Chipper and Cutter Knives

Proceedings of the Executive Committee Meeting

Held at the Congress Hotel, Chicago, Feb. 14-15, 1920

The meeting was called to order by Chairman John O'Connell, with the following members present: Fred C. Boyce, D. F. O'Connell, Peter J. Massey, William Fogarty, Ed. T. A. Coughlin, R. J. Cunningham, and John Hercher.

Motion was made by Ed. Coughlin, and seconded by Fred Boyce, that the executive committee officers be elected to serve for the balance of the business year or until the next regular meeting of the association, was carried.

The nomination for officers being then in order, Mr. John O'Connell was nominated to fill the office of chairman by R. F. Cunningham; the nomination was seconded by Ed. Coughlin.

Motion made by Mr. Boyce, and seconded by Ed. Coughlin, that the nominations be closed, and that the secretary be instructed to cast a ballot for John O'Connell as chairman of the executive committee, was carried unanimously.

The secretary then cast the ballot as instructed, and Mr. John O'Connell was declared elected unanimously as chairman of the executive committee.

The nominations for secretary of the committee, now being in order, Wm. Fogarty nominated P. J. Massey for the office of secretary; the nomination was seconded by Ed. Coughlin. There being no other nominations, Mr. Massey was declared elected unanimously as secretary of the executive committee.

The next business taken up for consideration was some of the changes, additions, and amendments to the constitution and by-laws that have from time to time been suggested by the membership, in order that they may be worked out in a suitable form to be presented for ratification by the membership at the next regular meeting at Buffalo, June 4-5, giving all the paid-up members the customary seven days notice, as provided by the constitution. The changes, additions, and amendments for each Article were discussed separately, and adopted in the following order:

ARTICLE III.

Membership.

Section One. There shall be two classes of membership; namely, active and associate membership.

Section Two. Every superintendent actually engaged in the preparation of pulp wood, the conversion of pulp wood to wood pulp, the conversion of wood pulp, rags, waste paper, or any other fibrous materials to halfstuff, the conversion of halfstuff to paper, or in the manufacture or conversion of pulp, paper, or paper products within the common application of the term in the United States and Canada, shall be eligible to active membership.

Section Three. Every pulp or paper mill manager,

THE WORLD STANDARD

The Mullen Paper Tester

The Adopted Standard of the United States Government, the Freight Classification Committees and the General Paper Trade.

The Mullen Paper Tester

Registers the breaking strength in actual pounds per square inch, not in a mere arbitrary scale. Made in various sizes to test all grades of paper goods from the lightest tissues to the heaviest boxboards.

Send for Catalogue and References

B. F. PERKINS & SON, Inc.

Sole Manufacturers HOLYOKE, MASS.

BOLTON QUALITY

CHIPPER KNIVES · BEATER KNIVES · BARKER KNIVES · BEATER PLATES

REMEMBER

BOLTON QUALITY

When it is a matter of

Barker Knives
Beater Bed Plates
Beater Fly Bars
Chipper Knives
Jordan Engine Fillings
Paper Trimming Knives
Rag Cutter Knives
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Of every description used in Paper and Pulp Mills

¶ Designed to meet specific needs and of uniformly High Grade.

John W. Bolton & Sons, Inc.
LAWRENCE, MASS.

JORDAN FILLING

Appleton

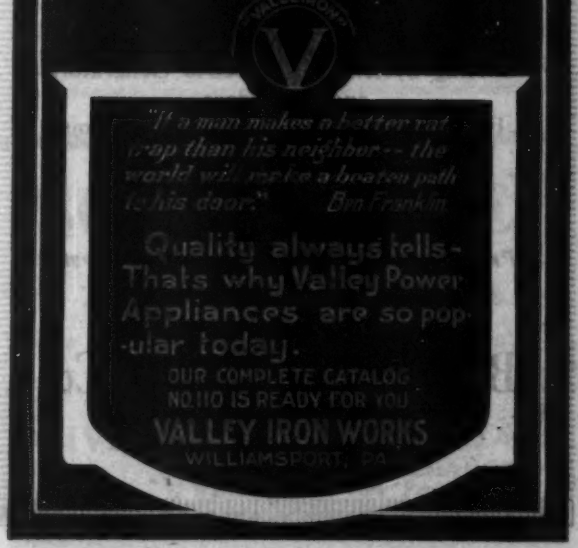
Felts and Jackets

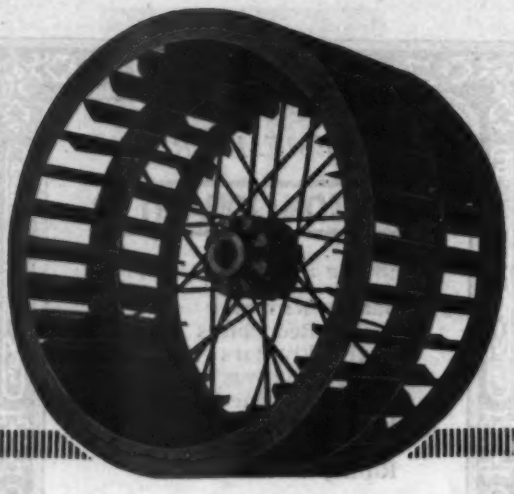
Manufactured By

APPLETON WOOLEN MILLS

APPLETON, WIS.

VALLEY


"If a man makes a better rat trap than his neighbor -- the world will make a beaten path to his door." Ben Franklin
Quality always tells - Thats why Valley Power Appliances are so popular today.
OUR COMPLETE CATALOG NO.110 IS READY FOR YOU
VALLEY IRON WORKS
WILLIAMSPORT, PA.



Bayley

AIR ENGINEERING
in the
PAPER INDUSTRY

YOU know what a part "driven" air plays in the production of your mill output, but are you thoroughly acquainted with what the Bayley engineers are doing for paper mills?

If you are not, write us at once—our specialized ability is at your service in the designing, construction and installation of

Forced and Induced Draft System
Pneumatic Chip Ash Handling System
Cooling Systems for Electric Generators and Calenders
Forced Heating and Ventilating Systems
Absorption Systems
Dust Collection Systems

Practical advice, including plans and estimates, will be furnished on request.

Bayley Manufacturing Co.
732 Greenbush Street,
Milwaukee, Wis.

who is actively engaged in the manufacture or conversion of pulp, paper, or paper products, shall be eligible to associate membership.

Section Four. Any such individual may become a member of this association upon formal application for membership therein, made in writing to the secretary, upon due election as such at any regular meeting of the executive committee by a unanimous vote of the members present, and upon payment of dues for the current year in advance.

Motion made by D. F. O'Connell, and seconded by Wm. Fogarty, that the entire Article III as amended, be adopted as read, was carried.

ARTICLE V.

Meetings.

Section One. No change.
Section Two. No change.
Section Three. No change.
Section Four. No change.
Section Five. No change.

Section Six. The meetings and other business of the association shall be under the management of the executive committee.

The majority of the executive shall constitute a quorum for the transaction of business for the association.

Section Seven. The executive committee shall consist of the President, the Vice-President, and the Secretary-Treasurer of the association, the chairman of each and every division of the association, and three (3) members appointed by the president.

Section Eight. The executive committee shall elect a chairman and a secretary. The chairman shall preside at all meetings of the committee, and will call such committee meetings as may from time to time be necessary for the transaction of business for the association.

Motion made by Fred Boyce, and seconded by R. J. Cunningham, that Article V. with all the amendments, be adopted as read, was carried.

The secretary was then instructed to send out notices of all the contemplated changes to each and every member in good standing, as provided in the constitution, Article IX; Section One, "———seven days notice of the contemplated changes having been sent to all the members," in order that they might be fully informed and be thereby enabled to act accordingly.

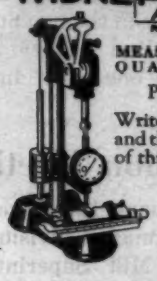
Motion made by D. F. O'Connell and seconded by R. J. Cunningham, that the expenses incurred by the individual members of the executive committee to attend the present or any subsequent meeting, be paid for by the association, was carried.

Motion made by Fred C. Boyce, and seconded by Ed. Coughlin, that the secretary-treasurer of the association, P. J. Massey, be paid a salary of Fifty ($50) Dollars per month, said salary to begin with January 1st, 1920, was carried.

WIDNEY MODULIMETER

A TEST

PATENTS PENDING



MEASURES EVERY PHYSICAL QUALITY IN MATERIAL

Paper, Felt, Rubber, Etc.

Write for our booklet—just out—and the story of the development of this universal testing device.

WIDNEY
TEST LABORATORIES
Physical Tests and Research
352 S. Jefferson St. Chicago

SIGNODE SYSTEM

Framed Reams, strapped with Signode System

Signode straps insure delivery of framed paper bundles in the same condition they leave the mill. Cheaper than rope. No battered corners. Liberal trial arrangement.

Write for Particulars and Prices

The Signode System, Inc.
564 W. Adams Street CHICAGO, ILL.

This is the

Trimbey Automatic Consistency Regulator

REGULATORS that REALLY REGULATE. which will cause stock to be delivered to beaters, mixers or paper machines at a uniform consistency. Something long sought in the paper industry.

M. G. TIBBITTS

Glens Falls, N. Y.

SIMONDS

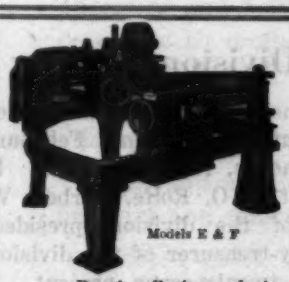
KNIVES and CUTTERS

Simonds Service backed by Simonds Quality is found in every Simonds Knife, whether it be a Barker, Chipper, Rag or Paper knife. They are perfect as to workmanship, temper and balance. Because they hold their cutting edge and operate efficiently, Simonds Knives are used in the largest mills throughout the country. Write us about your cutting problems.

Simonds Manufacturing Co.

"The Saw Makers"
FITCHBURG, MASS.

CHICAGO, ILL. NEW ORLEANS, LA. MONTREAL, QUE.
NEW YORK CITY SAN FRANCISCO, CAL. MEMPHIS, TENN.
PORTLAND, ORE. VANCOUVER, B. C. SEATTLE, WASH.
LOCKPORT, N. Y. LONDON, ENGLAND ST. JOHN, N. B.



Models E & F

Cold Pipe Bending Machines

Standard of the world.

Bends all sizes of pipe from ⅛ in. to 8 in. Hand or motor operated.

Send for catalog.

American Pipe Bending Machine Co.
12 Pearl Street, BOSTON, MASS.

PHOENIX SOAPSTONE FIRE BRICK

Large Arch and Square Blocks a Specialty
All Shapes and Sizes

PROMPT DELIVERIES

OLIVER BROS., Inc., Va. Div.

Plant: Arrington, Va. *Executive Offices:* 97 Warren St., New York *Pittsburgh Office:* People's Bldg.

BETTER Knife Grinding at Minimum Expense

One of Many Types Full Automatic Knife Grinder Stationery Knife Bar—Traveling Grinding Wheel.

IN these days of high costs, a comparatively low priced machine of strictest accuracy, of simple construction, but full automatic in every respect, and of heavy, rigid build, insuring long service, offers real economy in keeping all knives from 6-inch to 190-inch, up to highest cutting efficiency. We make all types of grinders for every variety of service in fitting knives, saws, shear blades, etc.

Write for Catalog and commendations on your requirements.

Machinery Co. of America

Big Rapids, Michigan, U. S. A.

Branch: Seattle, Wash.

Motion made by D. F. O'Connell, and seconded by Ed. Coughlin, that meetings be held at Watertown, N. Y., Holyoke, Mass., Portland, Me., and at any other point in N. Y. State that may be in the meantime suggested by the membership in that locality, and that these meetings be held all in one week during the

Kalamazoo Division Meeting

On Monday evening, February 16th, the regular monthly meeting of the Kalamazoo Division of the American Pulp and Paper Mill Superintendents' Association was held in conjunction with the Local Division of the Cost Association at the Park-American hotel.

Mr. Pooler, of the American Writing Paper Company, delivered an interesting address on cost accounting, and illustrated his remarks with a number of slides showing various forms. Mr. Zieber, of the Imperial Belting Company, addressed the meeting on the subject of Leather Belting. There were a little more than fifty present, and the following firms were represented:

Bardeen Paper Co.; Monarch Paper Co.; Rex Paper Co.; King Paper Co.; Glendale Pulp & Paper Co.; Kalamazoo Vegetable Parchment Co.; Kalamazoo Paper Co.; Hawthorne Paper Co.; Standard Paper Co.; Eddy Paper Co.; Peninsular Paper Co.; Wolverine Paper Co.; Mac Sim Bar Paper Co.; Western Paper Makers Chemical Co.; Bryant Paper Co.; Watervliet Paper Co.; Kalamazoo Stationery Co.; American Writing Co.; Imperial Belting Co.; Shartle Machine Co., and Michigan Carton Co.

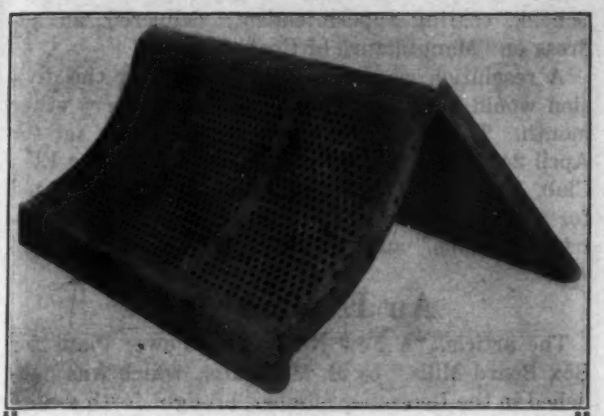
The March Meeting

The Kalamazoo branch held their regular monthly meeting at the Park-American Hotel, Monday evening, March 16th. There were fourteen members and visitors in attendance.

After a good dinner an address was delivered on industrial cars, augmented by moving pictures showing many uses of industrial trucks.

Miami Valley Division Meeting

The regular monthly meeting of the Miami Valley division was held on Saturday evening, February 28th, at the Elks Clubhouse, Hamilton, Ohio. In the absence of President A. O. Rolfe, Herbert W. Server, vice-chairman of the division, presided; H. H. Latimer, secretary-treasurer of the division, secretary. There were twenty-seven present. A very interesting paper was read by Mr. M. A. Moreland, combustion engineer, on "Power Plant Economy." Mr. R. E. Davis, B. S., Ch. E., delivered an address on "Colloidal Chemistry," and Mr. W. T.



Because there are no moving parts this is a very simple but very efficient device. Patent No. 1,271,426 issued to Mr. Brownell Buehler, July 2nd, 1918.

The Shartle Continuous Beater Company
MIDDLETOWN, OHIO

Real Service

If you are interested in obtaining real service in purchasing or disposing of paper mill property or equipment, we are exceptionally well qualified for the work.

Our concern has been in the paper mill machinery business for thirty years and has an enviable reputation, and a staff including:

One who has had an experience of thirty years purchasing, selling and dismantling paper mills and paper mill machinery, and who is acquainted with a majority of the mills of the country;

One who is a Technology graduate, has had ten years' experience in some of the best paper mills and who was superintendent of a high grade mill for five years;

Two Technology graduates with engineering training.

FRANK H. DAVIS COMPANY
175 Richdale Avenue, Cambridge, Mass.

Wanted — Sulphite Superintendent

Sulphite Mill is in connection with Groundwood and Newsprint Mill. Applicant must have thorough practical knowledge of digester operation and Acid System and be receptive to modern methods of technical control. Also familiar with applying cost information towards economical operation.

Reply stating full history of experience and salary required.

Address A. B. C., The Paper Industry.

"Dayton" Beating Engines are Built for Heavy Duty

Dayton Beater and Hoist Co.
DAYTON, OHIO

Handling Materials at the Mill

IS YOURS one of the many mills which handles considerable pulp? Some of these have found it to be more rapid and economical to do this handling with a Brownhoist locomotive crane. A Brownhoist will not only place the pulp wherever it is needed, but will handle your coal, switch the cars and take care of innumerable jobs which come up around the yard. If you have much handling to do, our long crane experience should be of use to you. We will gladly give you any information for the asking.

The
Brown Hoisting Machinery Co.
CLEVELAND, OHIO, U.S.A.

Engineers and Manufacturers of Heavy Dock Machinery Bridge Cranes, etc., as well as smaller Cranes and Hoists

Branch Offices in New York, Pittsburgh, Chicago and San Francisco.

Schenk, coating superintendent, delivered an address on "Manufacture of Coated Paper."

A resolution was passed that, hereafter the division would hold their regular meetings every other month. The date of the next meeting was set for April 24th, at 6 o'clock p. m., to be held at the Elks Club, Hamilton, Ohio. Addresses already arranged for to be delivered on that occasion will be "Industrial Relations," and "Rosin Size."

An Explanation

The article, "A Few Notes on a Power Plant for Box Board Mills," by B. M. Baxter, which was published in the December number, brought forth a comment to which Mr. Baxter addresses the following letter:

"My attention has been called to the fact that an inference might be drawn from my article on power requirements of box board mills published in your number of December last, unfair to the suction roll as applied to such machines.

"A statement was made that the power required to operate the constant speed line shaft of a five cylinder board machine might safely be taken as 75-horsepower, but that a large machine fitted with suction rolls might require 200 horsepower. The inference might be that the difference would be chargeable to the power of operation of the vacuum pumps of the rolls.

"Both these statements were taken from concrete examples. The machine requiring in the neighborhood of 200 horsepower is a wide machine producing up to about 100 tons per day. This has considerable bearing upon the power requirements of the constant speed line since the tonnage made fixes the amount of water handled by the vat pumps and the amount increases directly with the tonnage.

In addition to the vat pumps, there are also driven from this constant speed line, 12 plate screens, four agitators, four stock pumps with about 26-foot discharge head, two save-alls, felt whippers and two vacuum pumps, one operating a suction drum roll at about 20-inch vacuum and one operating two other suction rolls.

"Hence it will be seen that no correct inference can be drawn that the difference in power consumption of the two machines is caused by the suction roll vacuum pumps alone, since there would be a considerable increase in the addition of two more cylinders and a very material further increase on account of the greater tonnage made which is about double that made on the five cylinder machine.

"The purpose in mind in writing this portion of the published article was to bring out the necessity of making a study of any particular case when providing for power and that it could not be assumed that the power required to drive the constant speed line of one machine would be the same as that required for another."

Eastwood Wire Mfg. Co.

Fourdrinier Wires

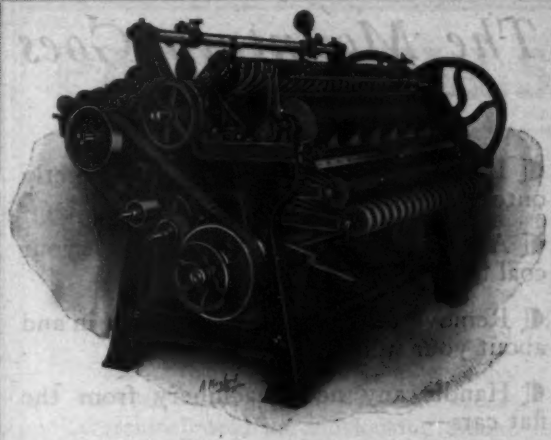
BELLEVILLE, NEW JERSEY
U. S. A.

We also manufacture

Cylinder Wires
Valves Unions Cocks
Fittings
Castings, etc.

FROM OUR

PERFECTION BRONZE



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Single, Duplex, and Diagonal

CUTTER KNIVES
PATENT TOP SLITTERS

Hamblet Machine Co.
LAWRENCE, MASS.

Jenssen Two-Tower Acid System

56 Installations in operation or under construction on this Continent or Abroad

G. D. Jenssen Company
200 Fifth Avenue
New York

Jenssen Acid Towers at Great Northern Paper Co. Mill at Millinocket, Maine

¶ Are you receiving all the Clay you need and the grade that you want? Or are you accepting any old grade just so long as you can get delivery.

¶ Our customers are receiving the same grade as usual and do not even know there is a shortage.

¶ We are in a position to give this same Service to you on

Washed Clay

Because—

QUANTITY: Largest production in United States.

QUALITY: Lowest grit and moisture contents of any clay, domestic or foreign.

DELIVERIES: Reserve stock always on hand.

PLANTS: Three huge plants at McIntyre, Ga., under direct control of Edgar Bros. Co., also Saylorsburg, Pa., and Gordon, Ga.

CRUDE CLAY: Paragon and Excelsior Brands.

MINER-EDGAR CO.
30 Church St. New York

The Mountain Goes to Mohamet

¶ If you wish to unload pulpwood directly onto your woodpile—

¶ A carload of coal directly into your coal bins—

¶ Remove the accumulated rubbish in and about your wood yard—

¶ Handle any new machinery from the flat cars—

¶ Dig the excavation for any new addition to your plant—

BYERS' Auto Crane

will go right to the job. You do not have to bring the job to it.

Runs like an automobile, using gasoline, steam or electricity for motive power and does all your sling, clamshell, grab, orange-peel or magnet work equally well. It will do all your regular loading, unloading or lifting work at a saving of many dollars in time and labor, paying for itself in a very short time. *Write for Bulletin No. 1016.*

John F. Byers Machine Company

311 Sycamore Street, Ravenna, Ohio

Shipping in Fiber Boxes

The National Association of Shippers Using Fiber Containers, among whose members are most of the big users of this character of packages, has recently sent out a letter in which is set forth some observations of a member of the Official Freight Classification Committee. This committeeman made an inspection at representative stations of existing conditions incident to the handling, stowing and forwarding of all varieties of shipments, particularly those packed in corrugated and solid boxes. Many violations and a lack of knowledge on the part of the shippers of the rules governing the use of this character of container were found to exist. Examples of improper sealing which failed to cover all the outer joints, openings or seams, and the lack of reinforcing strips where they were required, were very common. Stenciling the name and address of the consignee over the sealing tape, which is lost if the strip becomes damaged, was found to be practiced. Most important, however, to the paper industry was the discovery of the practice of re-using the fiber boxes. This is directly contrary to the idea in mind of the carriers who conceded the use of fiber containers. It was hoped that this method of shipping would establish an original one-time container and discourage the use of second-hand boxes on account of constant difficulties and increasing loss claims arising from this practice.

The paper industry is particularly concerned in this great matter, affecting one of its largest products, and endorses all the views expressed by this association of shippers.

Formation of Converters' Group of the Cost Ass'n Inaugurated

At a dinner given at Hotel Nonotuck, Holyoke, Mass., on March 4th, by the Connecticut Valley Converters, the formation of a Converters' Group of the Cost Association of the Paper Industry was inaugurated. The meeting was presided over by Mr. G. A. Wilms, of the White & Wyckoff Mfg. Co., Holyoke. Mr. M. F. Peterson, of the United States Envelope Company, Springfield, was elected secretary of the meeting and was instructed to get in touch with the converters for the purpose of establishing a Converters' Group in connection with the Connecticut Valley Local Division of the Cost Association.

Mr. S. L. Bush, manager of research for the Crocker-McElwain and Chemical Paper Manufacturing Company of Holyoke, spoke on the advantages derived by the paper manufacturers from the Cost Association and invited the converters to imitate the example of the manufacturers. Mr. J. M. Allen, secretary-treasurer of the Cost Association, who came from New York to attend the dinner,

The
C. L. LaBOITEAUX CO.
Cincinnati Chicago Cleveland New York

TRADE MARK L X QUALITY SERVICE

PAPER BOX BOARDS
— FOR —
Folding Boxes, Set Up Boxes, Paper Cans, Shipping Containers, Etc.

Plain Strawboard
News Lined Strawboard
Book Lined Strawboard
Plain and Lined Chip Board
Single and Double Manila Lined News and Chip Board
Patent Coated Folding Box Board
Clay Coated Folding Box Board
Solid Manila Tag Board
Brown Jute Box Board
Oak Grained Jute Box Board
Marble Grained Jute Box Board
Pasted Container Board
Bristol Ticket Board
Diamond Wall Board
Champion All Leather Heel Board
Also other standard and special grades to order

PAPER MILLS

WE have a selling capacity twice our supply, and are in the market for paper in large volume, and would like to hear from you.

Our competent selling organization has from the beginning always demanded an ever increasing supply. We are at present all sold up and looking around for more, and are now in the market for five thousand tons in several grades.

We would be glad to hear from you what tonnage you can give us during this year. Write us.

Interstate Pulp & Paper Co., Inc.
Grand Central Terminal, New York City

F. G. MARQUARDT, President
HUGO THUM, Vice-Pres. CHAS. E. RAND, Secy.
A. D. LORENZ, Treasurer

F. G. Marquardt, Inc.

PAPER

and

Paper Makers' Supplies

345 Broadway, New York City

Packing House
ROCKVILLE CENTRE
NEW YORK

Special Attention Called to Our Own Packing and Assortment

N.O.C. N.O.C. N.O.C. N.O.C.
NEW YORK OVERSEA CO. INC.
Importers and Exporters of
WOOD PULP and PAPER
Offices located all over the World
New York — Christiania
Stockholm, Copenhagen, London, Paris, Marseilles, Genoa, San Francisco, Las Palmas, Calcutta, Samarang, Surabaya
Teneriffe, Maranham, Rio de Janeiro, Sao Paulo, Buenos Aires, Hong-Kong, Shanghai, Tientsin, Batavia, Durban, Cape Town, Valparaiso
NEW YORK 17 BATTERY PL. U.S.A.

Your Paper Mill

Would You Consider Selling It?

THERE never has been such an opportune time as right now! Sell while the selling is good if you want to get out now or in the future. We can and will gladly handle it for you openly or confidentially.

Gibbs-Brower Co.

Paper and Pulp Mill Brokers

261 Broadway
New York City
TELEPHONE: BARCLAY 8020

Our Motto: "Service First"

We are prepared to deliver promptly in any desired quantity the following:

Auramine	Bismarck Brown
Basic Green	Pulp Colors
Chrysoidine R	Vegetable Tallow
Chrysoidine Y	Casein
Methyl Violet	Soda Ash
Orange	Caustic Soda
Basic News Blue	Bleaching Powder
Stearate of Calcium	Stearate of Alumina

A. Klipstein & Company

644-652 Greenwich St., New York

Philadelphia Boston Providence
Charlotte Chicago Montreal

spoke of the objects and prospects of the national association.

All present endorsed the advisability of forming a Converters' Group. Among those present were: John G. Clark, New York-New England Co., Holyoke, Mass.; A. L. Janes, Holyoke Card & Paper Co., Springfield, Mass.; A. Beeton, Holyoke Card & Paper Co., Springfield, Mass.; W. F. Smith and H. C. Warnock, New York-New England Co., Holyoke, Mass.; W. F. Adams, Whiting & Cook, Holyoke, Mass.; W. E. Holman, Nat'l Blank Book Co., Holyoke, Mass.; Jas. Weir, U. S. Envelope Co., Springfield, Mass.; S. L. Bush, Chemical Paper Mfg. Co., Holyoke, Mass.

Found—A Gem

The following letter was received a few days ago from an employee of one of the paper mills at Los Angeles, Cal., and indicates what these men think of The Paper Industry when they see it. There are thousands of other employees in mills that would feel the same way as this man did if they made the same find:

> I accidentally found one of your paper trade journals in our "broke" one day and was so pleased with it, I am enclosing two dollars for one year's subscription. Hoping to receive an early number of this fine magazine, I remain,
>
> Yours truly,
> U. Grant Farmer.

Are We Destined for the "Booby Hatch?"

A man in Springfield, Ill., writes the following to the Collector of Internal Revenue of his district in reference to figuring his income tax:

"There need be little trouble to figure your income tax. In the first place it may be worked out by algebra, astronomy, trigonometry or syntax, and then your answer may be correct, and it may not. If your income is $2,400 a year and you have a diamond ring and an automobile, and are married to a brunette girl 26 years old, you take the amount of your income and add your personal property, subtract your street number, multiply by your wife's height and divide by your telephone number.

"If you have a child in your family you subtract $200 from your income, add the amount of your personal property, multiply by your waist measure, subtract the size of your collar and your child's age, multiply by the amount you have given the church during the year and divide by the number of your automobile license tag. If there is a second child you deduct $400 from your income, add the weight and age of the child, divide by the date of your birth, multiply by the size of your hat and subtract the weight of your mother-in-law. After you get it all figured out you won't have to pay any taxes of any name or nature, for they will have you in the booby hatch, strapped down."

WOLVERINE
Paper Company

"Wolverine" Waxed Papers for Every Requirement

Best Quality

Waxed Tissue a Specialty

OTSEGO, MICHIGAN

BERMINGHAM & PROSSER CO.
Kalamazoo, Michigan

PAPER Distributors

Let us submit an estimate on your next

Catalog
Booklet
Broadside
or Magazine

Bonds—Ledgers Writings

A Grade for Every Requirement

All of the same high standard of value as

SYSTEMS BOND

"The Ring-control Light-dried Paper at the Reasonable Price"

Eastern Manufacturing Company

GENERAL SALES OFFICES

501 Fifth Avenue NEW YORK

Mills at Bangor and Lincoln, Maine

HAMMERMILL BOND

HAMMERMILL

SAFETY

HAMMERMILL LEDGER

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The Standard Utility Business Papers and the Most Widely Used Papers in the World

MADE BY

HAMMERMILL PAPER CO., Erie, Pa.

NEW YORK OFFICE: 291 BROADWAY

UNION SCREEN PLATE CO.
Fitchburg, Mass., U. S. A. Lennoxville, P. Q., Canada

UNION BRONZE SCREEN PLATES
(Best phosphorized Cast Metal)
Old Plates RECLOSED and RECUT to accurate gauge
UNION BRONZE SCREWS for Screen Plates
Immediate Delivery of the Largest Orders. Satisfaction Guaranteed

The Witham Screen Plate Fastener, Patented
THE ORIGINAL THE BEST

Remember
WM. A. HARDY & SONS
FITCHBURG, MASS.
Originators and Oldest Manufacturers
OF THE
Cast Bronze Screen Plate
ALSO SPECIALIZE IN
Acid Resisting Digester Parts

The Successful
SHORT BELT DRIVE

operates {efficiently / and quietly} in ALL positions

I Horizontally—tight side {top or bottom}
II Vertically—small pulley up
III Vertically—small pulley down
IV Quarter turn—tight side {top or bottom}
and ALL intermediate positions

Each drive designed for its specific work whether for 1 H.P. or 1400 H.P. or more.

The LENIX DRIVE is manufactured and sold only by

F. L. Smidth & Company
ENGINEERS
50 Church Street, New York

Booklet, "Saving Slippage and Space" for the asking

SCREEN PLATES *and*
DANDY ROLLS

Watermarking a Specialty

Central Manufacturing Co.
The Quick Service House
KALAMAZOO MICHIGAN

Ticonderoga Machine Works
TICONDEROGA, N. Y., U. S. A.
MANUFACTURERS OF
WARREN IMPROVED CALENDER **DOCTORS**
With Flexible Blades, Universal Adjustment and Control
(PATENTED)
WARREN IMPROVED PATENT DOUBLE DRUM **WINDERS**
Patent BALL VALVE Hydrant
Stock Circulating Systems *and*
other Paper Mill Specialties
SEND FOR OUR BULLETIN

Severe weather in many parts of the country, resulting in freight embargoes and hampering the movement of both the manufactured article from mills to distributing centers and of raw material from producing to consuming points, has been creative of increased tightness in the paper market. Manufacturers in numerous cases have been obliged to discontinue operations for short intervals, pending the receipt of fuel and raw stock, while jobbers and consumers have experienced unusual difficulty in obtaining fresh supplies of paper from mills. Spot lots in consequence are held at a premium, and buyers show willingness to meet any prices within reason to get prompt deliveries of various kinds of paper.

The situation has reached a point where buyers overlook matters of price so long as they are given assurance of getting supplies. Delivery is the all-important factor in the market at present, and it can be accurately said that a large part of the demand for every grade of paper is going unfilled. The reason for this is simple, and readily obvious. It is that consumption during the past few months has increased in such volume that the papermaking machinery of the country is inadequate to produce all the supply required. In other words, the proverbial law of demand and supply is running its true course, and there seems scant hope of relief until consumption and production are brought more within the scope of each other.

Mills making practically every description of paper are sold ahead for an indefinite time. Some have contracted for their entire output for the balance of the year; others which have a potential surplus over contract commitments in view for later on are refusing to dispose of this supply until it becomes immediately available. Among manufacturers there is a single train of thought, viz., how they can run their plants to produce larger tonnages of paper, while the one thing uppermost in minds of consumers is how and where they can acquire additional amount of paper.

The present market situation in paper is due solely to conditions above outlined. Healthiness therefore is its cardinal characteristic. This is in sharp contrast to prevailing situations in many other manufactured commodities, where speculative buying has created a supply vacuum and run prices up to unheard of heights. Demand alone has fixed paper values, and as long as demand continues of present proportions, makers and distributors of paper need not fear any recession in prices.

The International Paper Company has announced an advance of one-half a cent per pound in news print paper prices for delivery over the second quarter of this year, thereby establishing the contract basis on news print in standard rolls at 5 cents f. o. b. mills instead of 4.50 cents, the price ruling during the first quarter. News print in the open market is selling at anywhere between 9 and 11 cents a pound, and is extremely difficult to locate at any price. Book papers are quotably strong and are in pointed demand. Tissues and wrappings are moving actively and quotations show a steady uptrend. Fine papers of all varieties are in brisk call and firm in price. Boards are actively sought at strong quotations.

Closes Big Pulpwood Contract

The Eastern Manufacturing Co. has closed a 30-year contract at fixed price only slightly above the present level for 800,000 cords of pulpwood. This represents 10 years' supply at the present rate of cutting.

The Eastern management plans to utilize this new supply by cutting 35,000 cords annually for 14 years, after which new growth will be encouraged. It will not touch its own timberlands for the next decade.

This new contract, with other contracts, will enable it to cut from outside lands for 10 years. This further strengthens its unique pulpwood position, making it virtually independent in this respect.

The American Steam Conveyor Corporation announce that arrangements have been made with the Wellman Bibby Company, Ltd., 36 Kingsway, London, W. C. 2, England, to act as their representative in Great Britain and Ireland for the sale of the American Steam Ash Conveyor. The Wellman Bibby Company handle the sale of a number of American engineering products and it is their intention to manufacture the American Steam Ash Conveyor in England.

The Gibbs-Brower Company, who were the brokers in the sale, several months ago, of the Nixon & Costello Co.'s Whitehall Mill, at Whitehall, Maryland, are now in a position to advise the trade, that this property was purchased by Messrs A. A. Kotzen and B. Rosenberg, of No. 51 Chambers St., this city, and these gentlemen request that this property be known as being owned by Kotzen and Rosenberg, of the above address.

HIGH GRADE
Paper Manufacturers' Supplies
Chemical and Mechanical Wood Pulp

IMPORT EXPORT

RAGS—PAPERSTOCK
ROPE—BAGGING
STRINGS

INQUIRIES INVITED

E. B. THOMAS & CO.
INCORPORATED
ALFRED J. MORAN, Manager
100 Hudson St., NEW YORK

Established 1885 *LONG DISTANCE PHONES Harrison 5557-2840*

—To PAPER Manufacturers

Here is a message of interest for you.

¶ We pack forty different grades of Paper Stock.

¶ Our Daily Capacity is 300,000 pounds.

¶ We can give you both Quality and Quantity.

Send us your inquiries on the grades you want to use in your product.

MENDELSON BROS. PAPER STOCK CO.
General Offices, STANDARD OIL BUILDING
910 South Michigan Boulevard, CHICAGO
"The house with whom you eventually will trade"

FRANCIS HUGHES COMPANY
Paper Mill Supplies
CORRESPONDENCE SOLICITED
Private Switch on C. B. & Q. Tracks
21st Street at Loomis
CHICAGO, ILLINOIS

SALOMON BROS. & CO.
Importers and Exporters of
Cotton, Cottonwaste, Linters,
Ramie, Jute, Rubber
Import of All Grades of Rags and Rope
200 Fifth Ave.. NEW YORK

Main Paper Stock Co.
Incorporated
PACKERS OF WASTE PAPER STOCK
Old and New Rags, Bagging, Strings, Etc.
Importers—Exporters
Daily Capacity 300 Tons
Branches:
321 Pearl Street
423 East 132nd St.
General Offices and Warehouses:
25-31 Peck Slip, New York
Boston (Mass.) Office— 10 High St.
Holyoke (Mass.) Office—206 High St.

DANIEL M. HICKS
INCORPORATED
IMPORTERS DEALERS
ESTABLISHED 1895
Foreign and Domestic
Rags, Bagging, Rope and Waste Paper
200-5th AVENUE, NEW YORK CITY

Papermaking Rags

Papermaking rags are in a firm market position, there being a consistent demand from consuming sources and available supplies being just about of sufficient scope to cover the requirements of buyers. Stocks of certain grades are anything but plentiful —the high qualities in particular—and indications are that were it not for comparatively large receipts of foreign rags, domestic material of most descriptions would be fetching prices far above ruling levels. As spring approaches, paper manufacturers are holding off as much as possible in buying, and unfavorable transportation conditions due to the severe weather in many sections of the country also have checked the movement of supplies recently, but there is nevertheless a good strong undercurrent of demand, and few sizeable accumulations of rags remain unabsorbed in the market. Price changes during the past several weeks have been generally upward, which is the best possible evidence that consumers are operating consistently as buyers and that dealers and packers have but limited stocks on hand. White shirt cuttings of No. 1 quality are quotable at 20 cents a pound at shipping points, old No. 1 whites of repacked variety at from 12 cents upward, repacked thirds and blues at 5 to 5.25 cents, and No. 1 roofing rags at 3.60 to 3.75 cents. Quotations f. o. b. sellers' points are:

New Stock—	New York and Chicago
White shirt cuttings, No. 1	19.50-20.00
White shirt cuttings, No. 2	13.50-14.00
Fancy shirt cuttings	12.00-12.50
Washables, No. 1	10.25-10.50
Unbleached muslins	15.50-16.00
White lawns	17.50-18.00
Overall cuttings, blue	13.50-14.00
Black silesias	7.50- 8.00
Old stock—	
Whites, No. 1 repacked	12.00-13.00
Whites, No. 2 repacked	7.50- 8.00
Whites, house soiled	4.25- 4.50
Whites, street soiled	4.00- 4.25
Thirds and blues, repacked	5.00- 5.25
Thirds and blues, rough	4.50- 4.75
Black stockings	4.60- 4.80
Lace curtains	9.00- 9.25
Cotton canvas, No. 1	5.50- 6.00
White cotton batting	5.50- 5.75
Roofing, No. 1	3.60- 3.75
Roofing, No. 2	3.50- 3.60

Rope and Bagging

Demand for old rope is pressing and signs are not wanting that there is a lack of sufficient stock to fill all the wants of buyers. Fair-sized parcels of rope are coming in from abroad, yet, with this added supply, dealers claim to be pushed to find all the material desired, and the steady uptrend in quotations bears out the contention of traders that rope is scarce. No. 1 Manila rope is quoted at 7.25 to 7.50 cents a pound at shipping points, and reports have been heard of sales at higher levels. Old bagging is moving in routine fashion and at maintained prices, although there is not relatively as much demand for this commodity as for other kinds of papermaking material. Old gunny is selling at around 3.75 cents per pound, and mixed strings at 3 to 3.25 cents. Prices follow:

	New York and Chicago
Gunny, No. 1 domestic	3.65-3.85
Gunny, No. 1 foreign	3.65-3.85
Scrap bagging, No. 1	3.25-3.50
Roofing bagging	2.75-3.00
Wool tares, heavy	3.75-4.00
Wool tares, light	3.50-3.75
Manila rope, No. 1 foreign	7.25-7.50
Manila rope, No. 1 domestic	7.25-7.50
Sisal strings	3.40-3.60
Mixed strings	3.00-3.25

Old Papers

It might be expected that the decreased movement of old papers into mill channels because of freight embargoes and the general tie-up of railroad transportation in many parts of the country would have resulted in a lower level of prices. The same conditions affecting the shipment of supplies, however, have greatly curtailed collections of waste paper, and the market at present presents a very firm tone, with quotations in a majority of cases at higher points. Mills are placing orders with regularity and dealers seem more concerned over replenishing their stocks than in finding outlets for the material they have to dispose of. Old newspaper is in pointed demand. Box board manufacturers are buying actively, and there is also a large movement of this class of old paper for export, overissue and folded newspapers being sent to the Far East and other countries to be used as wrapping paper. Old books and magazines are in steady call, and quotations ranged around 3.50 cents a pound at shipping points for No. 1 heavy book stock. Shavings are freely sought, and there is a

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	New York and Chicago
Hard white shavings, No. 1	6.00-6.25
Hard white shavings, No. 2-3	4.75-5.50
Soft white shavings	5.40-5.60
Colored shavings	2.25-2.50
Heavy book, No. 1	3.50-3.60
Crumpled, No. 1	3.00-3.15
Ledger stock	3.50-3.75
Kraft, No. 1	3.25-3.50
Manilas, No. 1	2.00-2.15
White blank news	3.60-3.75
Overissue news, No. 1	2.50-2.65
Folded news	2.10-2.20
Mill wrappers	1.80-1.90
Box board cuttings	1.60-1.70
Mixed paper, No. 1	1.50-1.60
Common paper	1.00-1.10

Chemical Pulp

Not in a long time has the market for chemical wood pulp been in quite the strong position that it now is. Demand is of a pressing character, and with the large majority of producers sold ahead for some months and with but little Scandinavian pulp arriving here unsold, buyers are experiencing considerable difficulty in acquiring all the supply wanted. Spot offerings are very nearly a misnomer, and only small parcels of pulp are available for future shipment, and unless some radical changes in market conditions arise, the probabilities point to an even tighter supply situation during the course of the next month or two. Prices for the present are mainly nominal, and those appended represent chiefly levels at which transactions were last reported. Domestic bleached sulphite has sold at 6.50 cents per pound at pulp mills, easy bleaching sulphite at 5 cents, news grade sulphite at 4 cents, and Mitscherlich sulphite at 6 cents. Kraft pulp has advanced sharply in price, business being reported done at 4.50 cents at shipping points, and soda pulp is well nigh unobtainable for delivery over the next couple of months at any price. Quotations f. o. b. pulp mills follow:

Bleached sulphite	6.25-6.50
Easy bleaching sulphite	5.00-5.25
News grade sulphite	3.75-4.00
Soda pulp, bleached	5.25-5.50
Mitscherlich unbleached	5.75-6.00
Kraft, No. 1	4.50-4.75
Screenings, refined	1.50-1.75

Mechanical Pulp

The production of mechanically ground wood of domestic and Canadian mills is practically sold out entirely for the next two months, and the supply sit-

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Two—54" Dietz Slitters and Rewinders
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uation is marked by extreme tightness. Grinders in many parts of the country have been handicapped in their operations recently by the severe weather, which has frozen mill streams solid and held up deliveries of raw material, and production has not commenced to approximate that necessary to satisfy the wants of consumers. Spruce ground wood of prime quality and freshly ground is selling freely at $70 per ton at shipping points, and instances have been recorded where better than this has been paid for pulp for quick delivery. Until the thaw comes and manufacturers are enabled to increase their output, there is little relief in view from the prevailing tight condition of the market.

Chemicals

All kinds of chemicals used by paper and pulp manufacturers are in good demand, both from export sources and domestic consumers, and prices are marked by firmness. Producers in frequent instances, being booked ahead with orders, are discouraging further buying unless the need is imperative, and are doing what they can to satisfy the wants of customers. Latest quotations follow:

Alum, lump ammonia	4.00- 4.25
Alum, lump starch	8.25- 8.50
Alum, powdered	4.50- 4.75
Blanc fixe, powdered	4.50- 5.00
Bleaching powder (domestic drums)	3.00- 3.25
Brimstone (ton)	18.00-20.00
Casein	14.00-15.00
Caustic soda, spot delivery	4.00- 4.25
China clay, domestic, washed	11.00-12.00
China clay, foreign	18.00-24.00
Rosin, grade E	17.75-18.00
Satin white	2.25- 2.50
Soda ash, 58 per cent light (bags)	1.90- 2.00
Sulphite of alumina, commercial grade	1.75- 2.00
Starch, Globe, in bags	5.97-
Talc (ton)	16.00-16.50

A cargo of Swedish news print paper consisting of 3,313 rolls and weighing 1,475 tons, consigned to the National City Bank, arrived at New York on the steamer Sonja February 13. The paper was intended, it is understood, for the publisher of one of the big New York daily newspapers, and is the second of two large shipments made from Gothenburg to the United States.

At a recent meeting of the stockholders of the Buffalo Forge Company, new officers were appointed as follows: Henry W. Wendt, president; Edgar F. Wendt, vice-president and treasurer; Henry W. Wendt, Jr., vice-president and secretary; C. A. Booth, vice-president and sales manager. The new directors include the above named officers, and in addition, Mr. H. S. Whiting.

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New Papers

Writing—	
White rag	22-40
White sulphite, No. 1	14-20
Colored	16-25
Ledger—	
White rag	22-44
White sulphite	16-22
Colored sulphite	18-
Colored rag	24-
Bonds—	
White rag	19-50
White sulphite	15-25
Colored sulphite	16-28
Colored rag	19-52
Book—	
No. 1 S. & S. C.	10.50-11.00
Machine finished	10.00-10.50
English finished	11.00-13.00
Coated and enamel	12.00-15.00
Lithograph, M. F.	13.00-14.00
News Print—	
Rolls, contract	4.75- 5.00
Rolls, transient	9.00-11.00
Sheets	8.00- 8.50
Side runs	6.00- 6.50
Cover Stock—	
Coated, both sides	12.25-
Coated, one side	12.20-
Wrappings—	
No. 1 kraft	10.00-10.50
No. 2 kraft	9.00- 9.50
Boards—	New York and Chicago
Solid news	90.00-95.00
Straw	80.00-85.00
Plain chip	80.00-85.00
White coated chip	90.00-95.00
Manila coated chip	85.00-90.00
Binders board	80.00-90.00

At the annual meeting of the American Wood Pulp Importers' Association in New York on February 5, Sigmund Goldman of the Perkins-Goodwin Company of that city was elected president of the organization for the ensuing year. L. W. Bowmall of the American Woodpulp Corp. was elected secretary, Henry Atterbury of Atterbury Bros., Inc., treasurer, and Leon Gottheil of Castle, Gottheil & Overton, vice president. The new president has served as secretary of the association for a number of years.

News Personals

Walter E. Ihling, well known to Western paper manufacturers, particularly in and around Kalamazoo, Mich., his home town, has become affiliated with Atterbury Bros., Inc., importers of and dealers in papermakers' supplies, of New York, and will in the future represent that firm in the West.

J. M. Allen, of Louisville, Ky., has been selected to succeed M. F. Peterson as secretary and treasurer of the Cost Association of the Paper Industry, and assumed his new duties in the New York offices of the association on February 2. Previous to his service in the ordnance department of the army during the war, Mr. Allen practiced law in Louisville, which in turn followed a successful career as auditor of a large Southern manufacturing company. He is an expert accountant, which ably fits him for his new office.

The Bache Trading Company, Inc., importers of wood pulp, at 5 Beekman street, New York, recently was petitioned into bankruptcy by Herman L. Papsdorf, a creditor for $24,557.

Joseph H. Sutphin, who up to his retirement from active business life several years ago was president of the paper jobbing firm of the Sutphin Paper Company, 439 Lafayette street, New York, died on February 19 at his home in Brooklyn, N. Y., aged 79 years.

The James Leffel & Co., Springfield, Ohio, manufacturers of turbine water wheels, on March 15, 1920, will move their Boston offices from 79 Milk St., where they have been located for several years, to Room 610 Compton Bldg., 161 Devonshire St., Boston, Mass. This office will be in charge of Mr. A. S. Addison, who for several years was connected with the Boston office of this firm, but who for the past year has been located at the main offices and factories in Springfield, Ohio.

The United States Lace Paper Works, Inc., manufacturers of lace paper and gummed papers, has moved from New York to its own building at 163 Union avenue, Brooklyn, N. Y. The new plant is three stories, 50x100 feet, and affords the company ample room to continue the expansion which its business has shown recently.

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Chemical Pulp

Practically no wood pulp is now being received unsold in the United States from the Scandinavian countries. Occasional shipments are arriving at Atlantic ports, but just about the entire supply coming in is contracted for long before it is landed, while warehouse stocks are down to a minimum. Under such circumstances, there is very little imported pulp offered to consumers, and with paper manufacturers actively seeking supplies, an exceedingly strong market condition results. Quotations, although nominal to a large degree, are firm and are on the ascendency. Importers report that the quotations cabled from Sweden indicate that it is well nigh impossible to purchase unbleached sulphite for first open water shipment from that country at a landed cost here of less than 6.25 cents per pound. Other prices are proportionately as high. Sales of bleached sulphite have been made at 8 cents ex dock, while the sharp advance in kraft pulp quotations has been an outstanding feature of the market during the past several weeks. Prevailing quotations on No. 1 foreign kraft range from 4.75 to 5 cents on the dock. Receipts at New York in February and current quotations follow:

Bleached sulphite	$7.50-8.00
Unbleached sulphite, No. 1	5.50-6.00
Easy bleaching	6.00-6.25
Mitscherlich unbleached	6.00-6.50
Kraft	4.75-5.00

J. F. Patton & Co., 1,200 bls. from Copenhagen; National Bank of Commerce, 315 bls. from Copenhagen; American Woodpulp Corp., 10,013 bls. from Gothenburg; Birn and Wachenheim, 183 bls. from Hamburg; E. M. Sergeant & Co., 80 bls. from Christiania; Y. Gulkinen, 610 bls. from Hango, Finland; J. Anderson & Co., 875 bls. from Christiania; Tidewater Paper Mills Co., 10,150 bls. from Liverpool, N. S.; Order, 10,277 bls. from Hango, Finland.

Paper Stock

Arrivals of foreign papermaking materials were comparatively heavy in February. The feature of the trade for the month was the large quantities of rags received, which came chiefly from France, Holland, Germany and England. Exportations from these countries to the United States recently have increased to a point where consumers of rags are understood to be bringing pressure to bear on their respective governments to restrict the outward movement. This has resulted in at least one European country taking steps toward conserving rag supplies for home requirements, France having placed an export embargo on new cotton rags excepting under special licenses. Importers here report a ready demand for practically all the rags they offer, and papermakers are granting firm prices. Arrivals at New York during February follow:

Old Rope

International Purchasing Co., 659 coils from Rotterdam, 589 coils from Bristol, 1,430 coils from Hull, 72 pkgs. from Copenhagen, 336 coils from Antwerp; Edwin Butterworth & Co., 132 bls. from Antwerp; Old Colony Trust Co., 25 coils from Bristol, 24 bls. and 50 coils from Hull, 26 bls. from Antwerp; Irving National Bank, 209 pkgs. from Copenhagen; Bank of Montreal, 176 coils from Liverpool; Guaranty Trust Co., 77 bls. from Leith; E. J. Keller Co., 12 bls. from Manchester, 430 coils from Hull; Mechanics & Metals National Bank, 80 bls. from Algiers; Equitable Trust Co., 315 coils from Hull; N. E. Berzen, 302 coils and 28 bls. from Hull; British Bank of South America, 162 coils from Liverpool; Standard Bank of South Africa, 62 coils from Rotterdam; Brown Bros. & Co., 107 coils from Rotterdam; Neuss, Hesslein & Co., 12 bls. from Santiago; Adams Bag Co., 399 coils from Rotterdam; Parsons & Whittemore, 605 coils from Hull; DeGraw, Aymar & Co., 100 coils from Antwerp; Citizens National Bank, 78 coils from Hull Order, 244 coils from London, 66 bls. from Hong Kong, 28 bls. from Antwerp.

Old Bagging

Standard Bank of South Africa, 285 bls. from Bristol; W. Van Doorn, 414 bls. from Rotterdam; Bank of Montreal, 35 bls. from Liverpool; International Banking Corp., 76 bls. from Glasgow, 193 bls. from Manchester; Edwin Butterworth & Co., 218 bls. from Antwerp; Irving National Bank, 132 bls. from Manchester; Atlantic National Bank, 149 bls. from Manchester; Mechanics & Metals National Bank, 252 bls. from Manchester; Wilkinson Bros. & Co., 32 bls. from Manchester, 44 bls. from Hull; Castle, Gottheil & Overton, 71 bls. from Manchester; Maurice O'Meara Co., 208 bls. from Manchester; British Bank of South America, 60 bls. from Liverpool; Equitable Trust Co., 515 bls. from London; W. Schall & Co., 499 bls. from Dundee; Brown Bros. & Co., 65 bls. from Antwerp; Bank of New York, 260 bls. from Antwerp; Standard Bank of South Africa, 45 bls. from London; Parsons & Whittemore, 269 bls.

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from Rotterdam; Northern Metal Selling Co., 57 bls. from Rotterdam; Order, 163 bls. from Antwerp, 50 bls. from Dundee, 80 bls. from London.

Rags

Albion Trading Co., 37 bls. from Liverpool, 548 bls. from London; S. Bernstein & Co., 47 bls. from Liverpool; B. D. Kaplan & Co., 20 bls. from Hull; Castle, Gottheil & Overton, 390 bls. from Genoa, 380 bls. from London, 71 bls. from Rotterdam; Parsons & Whittemore, 1,724 bls. from Hull, 71 bls. from Rotterdam; E. J. Keller Co., 195 bls. from Hull; Wilkinson Bros. & Co., 223 bls. from Hull; Edwin Butterworth & Co., 38 bls. from Antwerp; A. Katzenstein, 83 bls. from Antwerp; A. Bronstein & Co., 49 bls. from Liverpool; E. Naumberg & Co., 129 bls. from Hull; Patent Vulcanite Roofing Co., 353 bls. from Antwerp; Certain-teed Products Corp., 823 bls. from Antwerp, 84 bls. from Rotterdam; Bank of New York, 775 bls. from Antwerp; Bank of Montreal, 126 bls. from Liverpool; Maurice O'Meara Co., 42 bls. from Rotterdam; R. Goldstein & Son, 77 bls. from Antwerp; Irving National Bank, 40 bls. from Antwerp, 39 bls. from London; Atlantic National Bank, 179 bls. from London; Baring Bros. & Co., 13 bls. from Antwerp; Standard Bank of South Africa, 122 bls. from Glasgow; Equitable Trust Co., 106 bls. from Hull, 1,588 bls. from Antwerp; Credit Comm'l de France, 58 bls. from Hull, 45 bls. from Antwerp; Citizens National Bank, 277 bls. from Hull; R. F. Downing & Co., 119 bls. from Manchester, 318 bls from London, 235 bls. from Antwerp; National City Bank, 423 bls. from Copenhagen, 327 bls. from Antwerp; Foreign Trade Banking Corp, 1,654 bls. from Antwerp; Brown Bros. & Co., 2,523 bls. from Antwerp; New Netherlands Bank, 791 bls. from Antwerp; Davies, Turner & Co., 179 bls. from Antwerp; Cosmopolitan Shipping Co., 223 bls. from Bordeaux; American Foreign Banking Corp., 315 bls. from Antwerp; 266 bls. from Hull; Kidder, Peabody & Co., 81 bls. from Antwerp; Goldman, Sachs & Co., 25 bls. from Hull, 143 bls. from Antwerp; W. Schall & Co., 290 bls. from Hull, 634 bls. from Havre; Guaranty Trust Co., 418 bls. from Rotterdam; Salomon Bros. & Co., 257 bls. from Rotterdam; Bank of the United States, 3 bls. from Rotterdam; W. Hughes & Co., 187 bls. from Rotterdam; Jaffe & Co., 114 bls. from Rotterdam; J. Rosenberg, 241 bls. from Hamburg; Order, 919 bls. from London, 1,073 bls. from Antwerp, 64 bls. from Hull.

Miscellaneous Paper Stock

Castle, Gottheil & Overton, 40 bls. from Liverpool, 1,443 bls. from Rotterdam; S. Silberman & Co., 213 bls. from Glasgow, 8 bls. from Rotterdam; E. J. Keller Co., 33 bls. from Glasgow, 655 bls. from Rotterdam; Maurice O'Meara Co., 169 bls. from Manchester, 423 bls. from Rotterdam; Daniel M. Hicks, Inc., 53 bls. from Manchester, 15 bls. from Glasgow; J. Barry, 69

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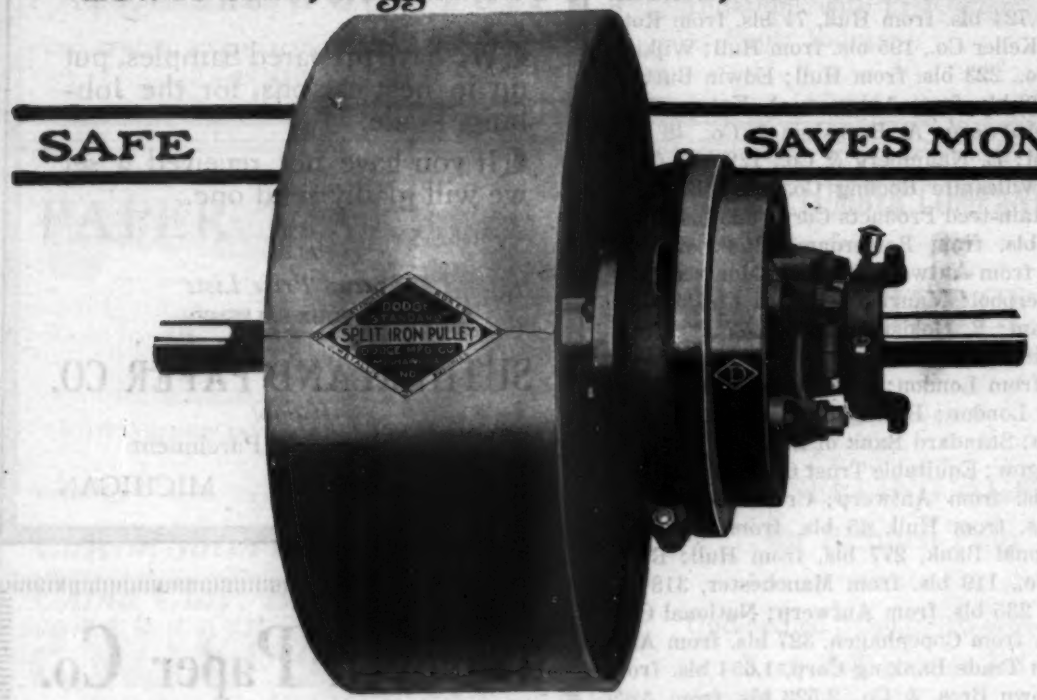

At less than the cost of installing a direct-connected motor you can buy and install a Dodge Friction Clutch which affords individual control of any machine, group of machines, or department in your factory.

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Philadelphia Cincinnati New York Chicago St. Louis Boston Atlanta Pittsburgh Minneapolis Dallas Providence Seattle Newark

bls. from Leith; W. H. Cummings, 197 bls. from Copenhagen; International Purchasing Co., 42 bls. from Antwerp; J. Nachmann, 23 bls. from Antwerp; Bartley Mfg. Co., 42 bls. from Rotterdam; Certainteed Products Corp., 52 bls. from Rotterdam; Jaffe & Co., 182 bls. from Rotterdam; Northern Metal Selling Co., 5 bls. from Rotterdam; S. Ruben & Bros., 136 bls. from Rotterdam; Salomon Bros. & Co., 737 bls. from Rotterdam; Goldman, Sachs & Co., 441 bls. from Antwerp; Kelly & Co., 113 bls. from Rotterdam; E. C. Marks & Co., 416 bls. from Rotterdam; Dallas Waste Mills, 350 bls. from Rotterdam; R. Goldstein & Son, 363 bls. from Rotterdam; E. Gross & Co., 307 bls. from Rotterdam; T. Kaufman & Son, 105 bls. from Rotterdam; Main Paper Stock Co., 792 bls. from Rotterdam; George W. Millar & Co., 330 bls. from Rotterdam; Equitable Trust Co., 701 bls. from Glasgow, 47 bls. from Leith, 86 bls. from London, 55 bls. from Antwerp; Parsons & Whittemore, 1,260 bls. from Rotterdam; Guaranty Trust Co., 66 bls. from Glasgow, 133 bls. from Antwerp, 668 bls. from Rotterdam; Brown Bros. & Co., 187 bls. from Glasgow; Foreign Trade Banking Corp., 76 bls. from Dundee, 14 bls. from Manchester; Irving National Bank, 269 bls. from Manchester, 397 bls. from Rotterdam; British Bank of South America, 1,124 bls. from Manchester; International Banking Corp., 279 bls. from Manchester, 65 bls. from Glasgow; National City Bank, 22 bls. from Manchester, 406 bls. from Antwerp, 171 bls. from Rotterdam; Standard Bank of South Africa, 122 bls. from Manchester; R. F. Downing & Co., 22 bls. from Manchester, 2,514 bls. from Rotterdam; Mechanics & Metals National Bank, 146 bls. from Manchester; Ladenburg, Thalman & Co., 172 bls. from Antwerp; Kidder, Peabody & Co., 252 bls. from Antwerp; Old Colony Trust Co., 89 bls. from Antwerp; Muller, Schall & Co., 47 bls. from Antwerp; W. Schall & Co., 311 bls. from Antwerp; Brown Bros. & Co., 83 bls. from Leith, 77 bls. from Glasgow; W. Hughes & Co., 363 bls. from Rotterdam; Heidelbach, Ickelheimer & Co., 304 bls. from Rotterdam; Wilkinson Bros. & Co., 119 bls. from Rotterdam; Order, 979 bls. from Antwerp, 133 bls. from Leith, 19 bls. from Liverpool, 467 bls. from Hull, 315 bls. from Glasgow.

Paper

Importations of paper in February were slightly larger than during the several preceding months. Cigarette paper from France continued to constitute the bulk of our foreign supply, although receipts of hanging and filter paper were fairly large. The feature of the month's imports was a shipment of 3,313 rolls of news print from Sweden to the National City Bank of New York. Arrivals at New York for the month follow:

Cigarette

American Tobacco Co., 1,600 cs. from Bordeaux, 108 cs. from Havre; P. O'Brein, 10 cs. from Bor-

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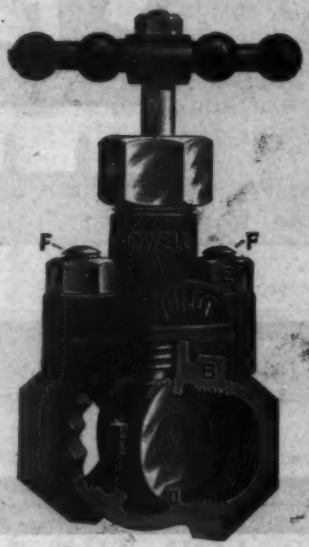

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¶ 1. Body and bonnet cast of a close grained iron of high tensile strength.

¶ 2. Made with bronze trimmings when required for medium steam pressure.

¶ 3. The double disc —not a wedge disc, but two discs with ball and socket back, smooth working and self-adjusting.

¶ 4. Made in all iron for cyanide solutions and other acids that attack bronze.

¶ 5. All working parts are made to gauge and are interchangeable.

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Will Be Pleased to Send "Pilot" Gate Valve Circular on Request.

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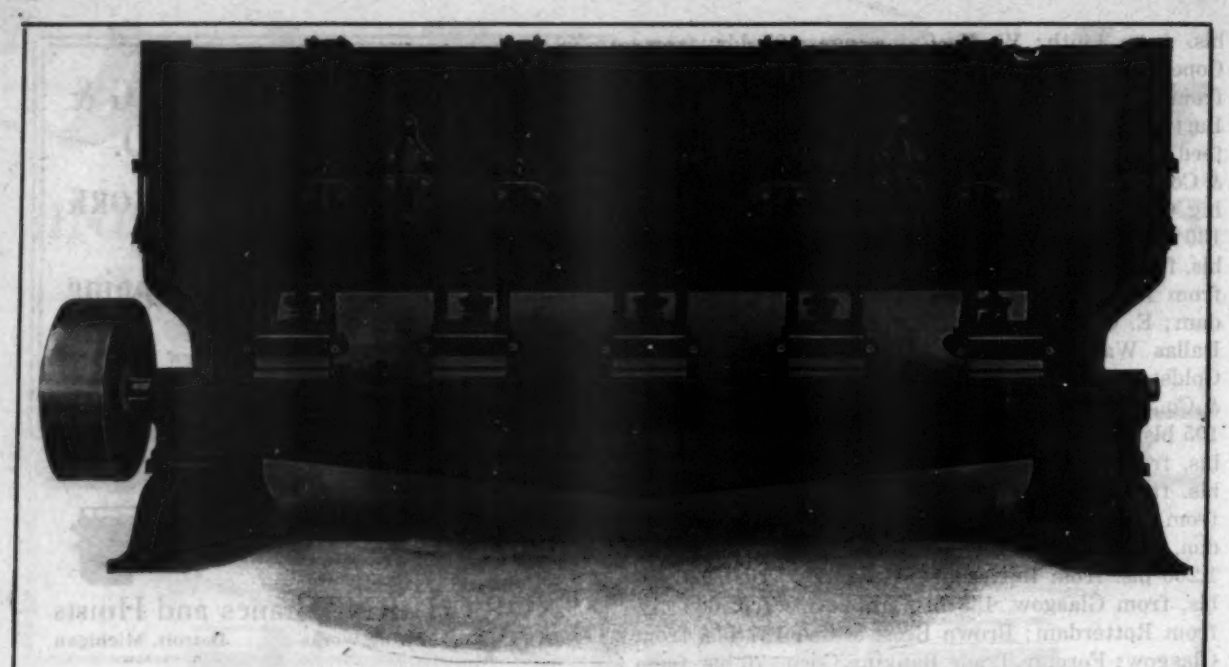

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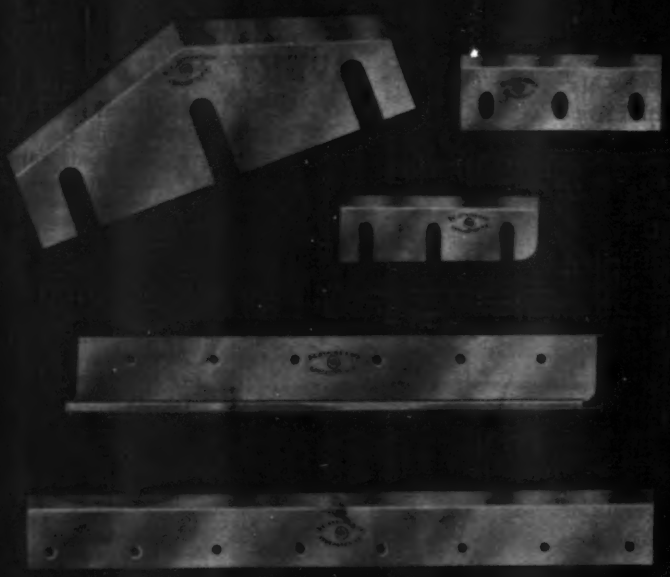

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Their excellent material, temper and workmanship assures you of knife satisfaction and we solicit a trial for them.

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Home Office and Factory: INDIANAPOLIS, IND. *Machine Knife Factory:* LANCASTER, N. Y.

deaux; Equitable Trust Co., 762 cs. from Bordeaux; Guaranty Trust Co., 29 cs. from Bordeaux; P. J. Schweitzer, 3 cs. from Bordeaux, 192 cs. from Genoa, 84 cs. from Havre; M. J. Levy, 4 cs. from Genoa; Rose & Frank Co., 97 cs. from Southampton, 17 cs. from Havre; Surbrug Co., 15 cs. from Southampton; Cosmopolitan Shipping Co., 300 cs. from Bordeaux; B. F. Teale, 34 cs. from Marseilles; Foreign Paper Mills, 25 cs. from Rotterdam; Order, 55 cs. from Havre.

Filter

Lunham & Moore, 16 cs. from London; E. Fougera & Co., 35 cs. from Bordeaux; M. Weise & Co., 81 bls. from Bordeaux; Schaar & Co., 1 cs. from Rotterdam.

Printing

South Street Bank of Philadelphia, 14 cs. from Genoa; Oxford University Press, 8 cs. from Liverpool; National City Bank, 3,313 rolls from Gothenburg.

Hanging

A. C. Dodman, 69 bls. from Liverpool; A. Murphy & Co., 15 bdls. from Liverpool; R. F. Downing & Co., 54 bls. from London; Prager Co., 38 cs. from Antwerp; L. F. Welch & Co., 2 cs. from Havre; W. H. S. Lloyd & Co., 104 pkgs. from London; E. G. Lecato & Co., 5 bls. from Havre; R. F. Lang & Co., 23 pkgs. from London.

Tissue

Wilkinson Bros. & Co., 15 bls. from Manchester.

Miscellaneous

Strype Paper Co., 11 cs. from Antwerp; C. D. Stone & Co., 92 cs. from Genoa; T. B. Maste & Co., 3 cs. from Genoa; G. Rikkers, 11 cs. from Rotterdam; Gallagher & Ascher, 2 cs. from Rotterdam; Globe Shipping Co., 13 cs. from Rotterdam; Prager Co., 50 cs. from Rotterdam; W. Schall & Co., 2 cs. from Havre; N. Y. Forwarding Co., 8 cs. from Christiania; Thomas & Pierson, 15 cs. from Hamburg; Winsor & Newton, 6 cs. from London; E. Dietzgen & Co., 4 cs. from London; Parsons Trading Co., 4 rolls from Buenos Aires; S. A. Leipsig, Inc., 2 cs. from Antwerp; E. Bennecke & Bro., 10 cs. from Hong Kong; Stone, Gross & Co., 2 bls. from London; Bendix Paper Co., 84 bls. from Hamburg; E. Fougera & Co., 5 cs. from Marseilles; Rose & Frank Co., 5 cs. from Antwerp; Favor, Ruhl & Co., 6 cs. from Hamburg; E. W. Devoe & Co., 8 cs. from Havre; Mansell, Hunt, Catty Co., 2 cs. from London; F. L. Kraemer & Co., 5 cs. from Rotterdam; New Jersey Worsted Spinning Co., 12 cs. from Rotterdam; C. B. Richard & Co., 4 cs. from Hamburg; Bankers Trust Co., 62 cs. from Hamburg; F. B. Vandergrift & Co., 3 cs. from Havre; Birn & Wachenheim, 16 cs. from Lisbon; Order, 163 cs. from Rotterdam, 10 cs. and 100 bdls. from London, 40 cs. from Hong Kong, 40 cs. from Hamburg.

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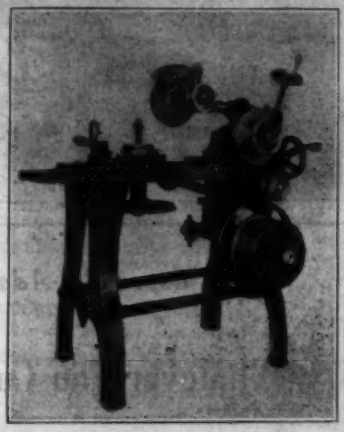
Costs less to do it yourself and you get better work and more of it if you use only sharp cutters.



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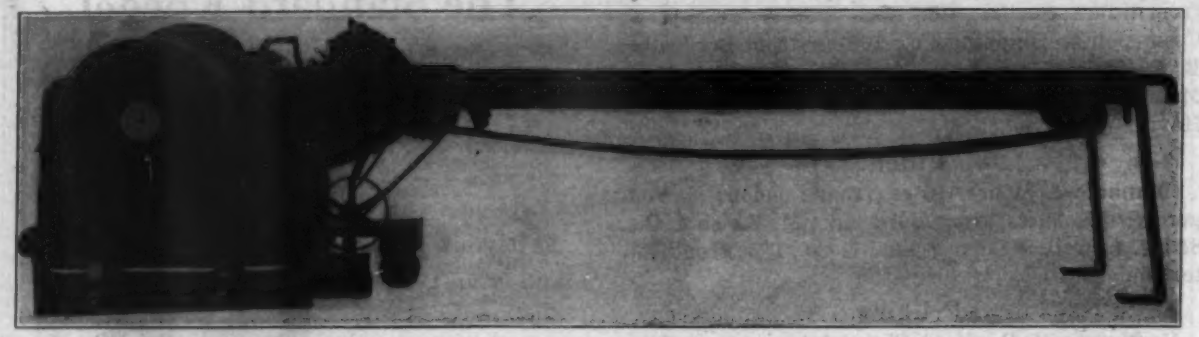

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Buyers' Guide—What and Where to Buy

Equipment, Apparatus, Supplies and Raw Materials Used by the Paper Industry

ADHESIVES
E. F. Russ Co., 201 Devonshire St., Boston, Mass.

ACID RESISTING BRONZE
Sandusky Foundry & Machine Co., Sandusky, Ohio.
William A. Hardy & Sons, Fitchburg, Mass.

AGITATOR EQUIPMENT
Dilts Machine Works, Fulton, N. Y.
The Hill Clutch Co., Cleveland, Ohio.
Moore & White Co., Philadelphia, Pa.

AIR CONDITIONING AND CONTROL APPARATUS
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., 732 Greenbush St., Milwaukee, Wis.
B. F. Sturtevant Co., Hyde Park, Boston, Mass.

ANGLE VALES
The Crane Company, Chicago, Ill.

ARCHITECTS
James L. Carey, 208 N. Laramie St., Chicago.
Hardy S. Ferguson, 200 Fifth Ave., New York City.
George F. Hardy, 309 Broadway, New York City.

ASSORTING TABLES
Moore and White Co., Philadelphia, Pa.

ASH CONVEYOR SYSTEMS
American Steam Conveyor Corp., Chicago, Ill.

BALING PRESSES
Ohio Cultivator Co., Belleville, O.

BARKERS
Carthage Machine Co., Carthage, N. Y.
Holyoke Machine Co., Holyoke, Mass.
Valley Iron Works Co., Appleton, Wis.

BARKING DRUMS
H. O. Numan, Green Bay, Wis.

BEATER BARS
John W. Bolton & Sons, Inc., Lawrence, Mass.
R. J. Dowd Knife Works, Beloit, Wis.
Simonds Manufacturing Co., Fitchburg, Mass.

BEATER BED PLATES
John W. Bolton & Sons, Inc., Lawrence, Mass.
R. J. Dowd Knife Works, Beloit, Wis.
Simonds Manufacturing Co., Fitchburg, Mass.

BEATER ROLL FILLING
John W. Bolton & Sons, Inc., Lawrence, Mass.
R. J. Dowd Knife Works, Beloit, Wis.
Simonds Manufacturing Co., Fitchburg, Mass.

BEATING, WASHING AND BLEACHING ENGINES
Dilts Machine Works, Fulton, N. Y.
Dayton Beater & Hoist Co., Dayton, Ohio.
Holyoke Machine Co., Holyoke, Mass.
Noble & Wood Machine Co., Hoosick Falls, N. Y.
Valley Iron Works Co., Appleton, Wis.

BEATERS (Continuous)
Claflin Engineering Co., Lancaster, Ohio.
The Griley-Unkle Eng. Co., Ft. Wayne, Ind.
Bird Machine Co., East Walpole, Mass.

BED PLATES
Dilts Machine Works, Fulton, N. Y.

BELTING (Rubber)
United States Rubber Co., New York and Chicago

BELT DRIVES
The Hill Clutch Co., Cleveland, Ohio.
The Link Belt Co., Chicago, Ill.

BLEACHING (Propellers)
Moore and White Co., Philadelphia, Pa.

BLANKETS
Frank F. Alt, 421 Columbia St., La Fayette, Ind

BLOWERS
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., 732 Greenbush St., Milwaukee, Wis.
B. F. Sturtevant Co., Hyde Park, Boston, Mass.

BOARD MACHINES
Beloit Iron Works, Beloit, Wis.
Valley Iron Works, Appleton, Wis.

BOARDS (Straw)
The C. L. La Belteaux Co., Cincinnati, O.

BOILER FEEDER
The Farnsworth Co., Conshohocken, Pa.

BOILER SETTINGS
McLeod & Henry Co., Troy, N. Y.

BRASS WIRE CLOTH
Appleton Wire Works, Appleton, Wis.
Cheney Bigelow Wire Works, Springfield, Mass.
Lindsay Wire Weaving Co., Cleveland, Ohio.
W. S. Tyler Co., Cleveland, Ohio.

BROKERS & FORWARDING AGENTS
Premier Shipping Co., 32 Broadway, N. Y. C.

BRIMSTONE
Union Sulphur Co., 17 Battery Place, New York City.

BRONZE JACKETS
Sandusky Foundry & Machine Co., Sandusky, Ohio.

BUNDLING SYSTEMS
Signode System, Lake St., Chicago

CALENDERS
Beloit Iron Works, Beloit, Wis.
Holyoke Machine Co., Holyoke, Mass.

CALENDER DOCTORS
Ticonderoga Machine Works, Ticonderoga, N.Y.

CALENDER ROLLS
Holyoke Machine Co., Holyoke, Mass.
B. F. Perkins and Son, Inc., Holyoke, Mass.

CASEIN
The Kalbfleisch Corp., 31 Union Square, N. Y. C.

CAST IRON PIPE
U. S. Cast Iron Mfg. Co., Pittsburgh, Pa.
Cast Iron Publicity Bureau, New York City.
Glamorgan Pipe & Foundry Co., Lynchburg, Va.

CAUSTICIZING APPARATUS
Glamorgan Pipe & Foundry Co., Lynchburg, Va.

CENTRIFUGAL PUMPS
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Glamorgan Pipe & Foundry Co., Lynchburg, Va.
Valley Iron Works Co., Appleton, Wis.
Wheeler Condenser & Engineering Co., Carteret, N. J.

CHEMICALS
The Grasselli Chemical Co., Cleveland, Ohio.
A. Klipstein & Co., 644 to 652 Greenwich St., New York City.

CHIP CRUSHERS
Carthage Machine Co., Carthage, N. Y.

CHIPPERS
Holyoke Machine Co., Holyoke, Mass.
Valley Iron Works Co., Appleton, Wis.

CHIPPER AND BARKER KNIVES
John W. Bolton & Sons, Inc., Lawrence, Mass.
Dilts Machine Works, Fulton, N. Y.
Simonds Manufacturing Co., Fitchburg, Mass.
R. J. Dowd Knife Works, Beloit, Wis.

CHIP SCREENS
Carthage Machine Co., Carthage, N. Y.

CLAYS AND FILLERS
Binney & Smith Co., 81 Fulton St., N. Y. C.
Daniel M. Hicks, 200 Fifth Ave., New York City.
The John W. Higman Co., Inc., 29 Broadway, New York City.
Miner-Edgar Co., 30 Church St., New York City.
International Pulp Co., 41 Park Row, N. Y. C.

COAL BUNKERS
The Brownhoist Co., Cleveland, Ohio.

COATED PAPERS
Bardeen Paper Co., Otsego, Mich.
Bermingham & Prosser, Chicago, Ill.
Bryant Paper Co., Kalamazoo, Mich.
Monarch Paper Co., Kalamazoo, Mich.
Seaman Paper Co., Chicago, Ill.
Watervliet Paper Co., Watervliet, Mich.

CONDENSING EQUIPMENT
Wheeler Condensing & Engineering Co., Carteret, N. J.

CONSTRUCTION (Building)
The Aladdin Co., Bay City, Mich.

CONSULTING ENGINEERS
James L. Carey, 208 N. Laramie St., Chicago, Ill.
Hardy S. Ferguson, 200 Fifth Ave., New York City.
George F. Hardy, 309 Broadway, New York City.

CONSULTING ENGINEERS (Power)
J. F. Carrigan Engineering Co., 304 Cunard Bldg., Chicago.

CONVEYORS
Portable Machine Co., Passaic, N. J.

CRANES
The Brownhoist Co., Cleveland, Ohio.
John F. Byers Co., Ravenna, Ohio.
Northern Engineering Works, Detroit, Mich.
The Chisholm-Moore Mfg. Co., Cleveland, O.
The Link Belt Co., Chicago, Ill.

CYLINDER MOLDS
Appleton Wire Works, Appleton, Wis.
Beloit Iron Works, Beloit, Wis.
Cheney Bigelow Wire Works, Springfield, Mass.
The Lindsay Wire Weaving Co., Cleveland, O.
W. S. Tyler Co., Cleveland, Ohio.

DANDY ROLLS
Appleton Wire Works, Appleton, Wis.
Central Mfg. Co., Kalamazoo, Mich.
Cheney Bigelow Wire Works, Springfield, Ohio.
Lindsay Wire Weaving Co., Cleveland, Ohio.
W. S. Tyler Co., Cleveland, Ohio.

DECKEL FRAME SUPPORTS
Huband and Nash, Menasha, Wis.

DRUM WINDERS
Beloit Iron Works, Beloit, Wis.
Ticonderoga Machine Co., Ticonderoga, N. Y.

DRYER FELTS
Albany Felt Co., Albany, N. Y.
Appleton Woolen Co., Appleton, Wis.
F. C. Huyck & Sons.
Shuler and Benninghofen, Hamilton, Ohio.

DYESTUFFS
Binney & Smith, 81-83 Fulton St., N. Y. City.
E. I. Du Pont de Nemours & Co., Wilmington, Del.
Grasselli Chemical Co., Cleveland, Ohio.
A. Klipstein & Co., 644 to 652 Greenwich St., New York City.

DUST COLLECTING SYSTEMS
Bayley Mfg. Co., 732 Greenbush St., Milwaukee, Wis.

ELEVATORS (Portable)
Economy Engineering Co., Chicago, Ill.
Lakewood Mfg. Co., The, Cleveland, Ohio.

ELECTRIC FANS
B. F. Perkins and Sons, Inc., Holyoke, Mass.

ELECTRIC HOISTS
John F. Byers Machine Co., Ravenna, Ohio.
Northern Engineering Co., Detroit, Mich.

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A SPECIAL filter for paper mills, producing all the results the paper manufacturer desires. It is a modificaton of the well known Hungerford filter adapted to paper mill use. It is constructed of concrete, strictly wrought iron pipe, brass strainers and especially prepared silica sand. It is as durable and efficient as can be built at any cost. It can be sold at a very low figure.

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"SIMS" Open Feed Water Heater, Filter and Purifier is the product of Modern Engineering Science and has met the demand for greater efficiency.

OPEN FEED construction is the most simple and effective principle of feed water heating and has less maintenance troubles and operating costs than any other type.

WATER HEATER feeds your boilers with hot water, reduces the strain from contraction and expansion due to feeding cold water and effects a saving of approximately 14.5% in fuel.

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Water containing earthy matter and carbonate of lime when heated close to the boiling point is thrown out of solution into suspension and is removed by the filter.

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THE SIMS COMPANY

"We Keep Others in Hot Water."

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Buyers' Guide—What and Where to Buy

Equipment, Apparatus, Supplies and Raw Materials Used by the Paper Industry

ELEVATING TRUCKS
Economy Engineering Co., Chicago, Ill
Lakewood Engineering Co., Cleveland, O.
Moore and White, Philadelphia, Pa.

ENGINES
Ball Engine Co., Erie, Pa.
The Brownell Co., Dayton, O.
Chandler and Taylor, Indianapolis, Ind.
Erie Engine Works, Erie, Pa.
Hooven, Owens, Rentschler Co., Hamilton, Ohio.

ENGINEERS
James L. Carey, 208 North Laramie St., Chicago, Ill.
George F. Hardy, 309 Brodway, New York City.
Hardy S. Ferguson, 200 Fifth Ave., New York City.
Stebbins Engineering & Mfg. Co., Watertown, N. Y.

ENGINEERS (Testing)
Widney Test Laboratories, Chicago, Ill.

EVAPORATORS:
Buffalo Foundry & Machine Co., Buffalo, N. Y.
Swenson Evaporator Co., Chicago, Ill.

EXHAUSTERS
Glamorgan Pipe & Foundry Co., Lynchburg, Va.

FANS
American Blower Co., Detroit, Mich.
Bayley Mfg. Co., 732 Greenbush St., Milwaukee, Wis.
B. F. Sturtevant Co., Hyde Park, Boston, Mass.

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Union Screen Plate Co., Fitchburg, Mass.

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Appleton Woolen Co., Appleton, Wis.
F. C. Huyck & Sons, Albany, N. Y.
Shuler and Benninghofen, Hamilton, Ohio.
Albany Felt Co., Albany, N. Y.

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Huband and Nash, Menasha, Wis.
Moore & White Co., Philadelphia, Pa.

FOURDRINIER WIRES
Appleton Wire Works, Appleton, Wis.
Cheney Bigelow Wire Works, Springfield, Mass.
Lindsay Wire Weaving Co., Cleveland, Ohio.
W. S. Tyler Co., Cleveland, Ohio.

FILTER (Continuous Suction)
Glamorgan Pipe & Foundry Co., Lynchburg, Va.
Green Bay Foundry & Machine Co., Green Bay, Wis.

FILTERS (Pressure and Gravity)
Graver Corporation, East Chicago, Ind.
Hungerford & Terry, Philadelphia, Pa.

FLY BARS
Dilts Machine Works, Fulton, N. Y.

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Moore and White Co., Philadelphia, Pa.

FIRE BRICK
Oliver Bros., 97 Warren St., New York City.

FURNACE ARCHES
McLeod & Henry Co., Troy, N. Y.

FUSES
Economy Fuse & Mfg. Co., Kinzie and Orleans Sts., Chicago, Ill.

GAS MASKS
National Appliance Co., Elgin, Ill.

GATE HOISTS FOR HYDRAULIC INSTALLATIONS
Dilts Machine Works, Fulton, N. Y.

GEARS
The Hill Clutch Co., Cleveland, Ohio.

GLUES
E. F. Russ Co., 201 Devonshire St., Boston, Mass.

GRINDERS
Holyoke Machine Co., Holyoke, Mass.
Valley Iron Works, Appleton, Wis.

HAND STOKERS
The Carrigan Engineering Co., Cunard Bldg., Chicago.
The Files Eng. Co., Inc., Providence, R. I.

HEAD GATE HOISTS
Dilts Machine Works, Fulton, N. Y.

HEATERS (Feed Water)
Graver Corporation, East Chicago, Ind.
The Sims Co., Erie, Pa.

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John F. Byers Machine Co., Ravenna, Ohio.
Northern Engineering Co., Detroit, Mich
The Chisholm-Moore Mfg. Co., Cleveland, Ohio.

HOSE
United States Rubber Co., Chicago, Ill.

HYDRAULIC HEAD GATE HOISTS
Dilts Machine Works, Fulton, N. Y.

HYDRAULIC TURBINES
Holyoke Machine Co., Holyoke, Mass.
James Leffel and Co., Springfield, Ohio.
S. Morgan Smith Co., York, Pa.

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Widney Test Laboratories, Chicago, Ill.

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Valley Iron Works Co., Appleton, Wis.

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J. W. Bolton & Sons, Inc., Lawrence, Mass.

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John W. Bolton & Sons, Inc., Lawrence, Mass.
R. J. Dowd Knife Works, Beloit, Wis.
Simonds Manufacturing Co., Fitchburg, Mass.

LAYBOYS
Moore and White Co., Philadelphia, Pa.

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Economy Engineering Co., Chicago, Ill.
Lakewood Eng. Co., The, Cleveland, O.
Lewis Shepard Mfg. Co., Chicago, Ill.

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Machinery Co. of America, Big Rapids, Mich.

LIGHTING EQUIPMENT
Benjamin Electric Co., Chicago, Ill.

LINE SHAFT BEARINGS
The Hill Clutch Co., Cleveland, Ohio.

MACHINE DRYER TEMP. CONTROL
Open Coil Heater and Purifier Co., Indianapolis, Ind.
Valley Iron Works, Appleton, Wis.

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Hart Trading Co., Inc., Tribune Bldg., New York City.
E. B. Thomas & Co., Inc., 100 Hudson St., New York City.

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Sanford Riley Stoker Co., Worcester, Mass.

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Wayne Oil Tank & Pump Co., Ft. Wayne, Ind.

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Stebbins Engineering & Mfg. Co., Watertown, N. Y.

MOISTURE TESTER
Williams Apparatus Co., Watertown, N. Y.

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Hamblet Machine Co., Lawrence, Mass.

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E. B. Thomas & Co., Inc., 100 Hudson St., New York City.
Interstate Pulp and Paper Co., Grand Central Bldg., New York City.
Lagerloef Trading Co., 18 E. 41st St., N. Y. C.
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Monarch Paper Co., Kalamazoo, Mich.
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Oxford Paper Co., 200 Fifth Ave., N. Y. City.
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E. B. Thomas & Co., Inc., 100 Hudson St., New York City.
Vito G. Cantasano & Bros., 185 South St., New York City.

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Gibbs-Brower Co., 261 Broadway, N. Y. C.

PAPER STOCK CUTTERS
Taylor, Stiles & Co., Riegelsville, N. J.

PAPER PULPING ENGINES
Noble & Wood Machine Co., Hoosick Falls, N. Y.

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Beloit Iron Works, Beloit, Wis.
The Sandy Hill Iron & Brass Works, Hudson Falls, N. Y.

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Widney Test Laboratories, Chicago, Ill.

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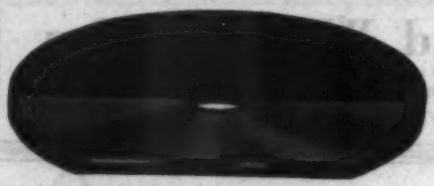
Sutherland Paper Co., Kalamazoo, Mich.



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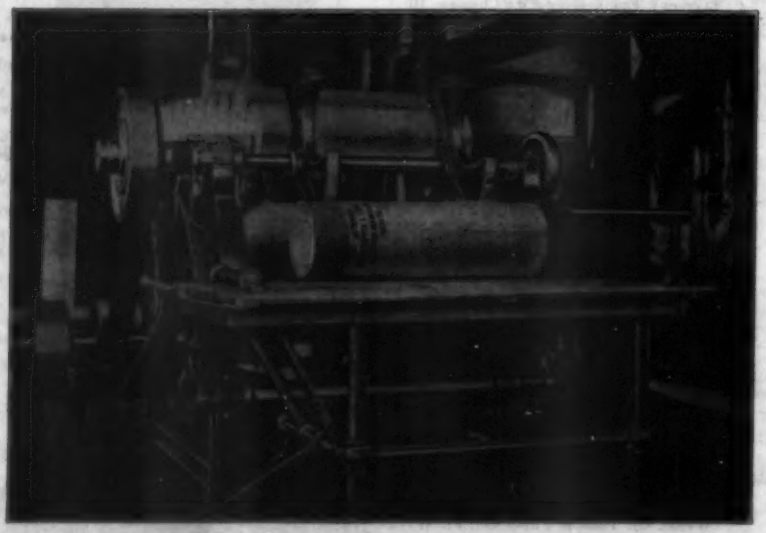

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PIPING EQUIPMENT
Pittsburgh Piping & Equip. Co., Pittsburgh, Pa.

PIPING SYSTEMS INSTALLED
Pittsburgh Piping & Equip. Co., Pittsburgh, Pa.

PLUG MACHINES
Carthage Machine Co., Carthage, N. Y.

PNEUMATIC CHIP HANDLING SYSTEMS
Bayley Mfg. Co., 732 Greenbush St., Milwaukee, Wis.

POWER TRANSMISSION
Dodge Sales & Engineering Co., Mishawaka, Ind.
F. L. Smidth & Co., 50 Church St., N. Y. C.
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Valley Iron Works, Williamsport, Pa.

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Eastern Manufacturing Co., 501 Fifth Ave., New York City.
Hart Trading Co., Inc., Tribune Bldg., New York City.
Daniel M. Hicks, 200 Fifth Ave., New York City.
E. J. Keller Company, 200 Fifth Ave., N. Y. C.
New York Overseas Co., Inc., 17 Battery Place, New York City.
Price & Pierce, Ltd., 30 East 42nd St., New York City.
The Pulp & Paper Trading Co., 21 East 40th St., New York City.
Scandinavian-American Trading Co., 50 East 42d St., New York City.
Lagerloef Trading Co., 18 E. 41st St., N. Y. C.

PULP EXTRACTORS
The Griley-Unkle Eng. Co., Ft. Wayne, Ind.

PULP AND PAPER MACHINERY
Beloit Iron Works, Beloit, Wis.
Bird Machine Co., East Walpole, Mass.
Moore & White Co., Philadelphia, Pa.
Valley Iron Works, Appleton, Wis.

PULP GRINDERS
Carthage Machine Co., Carthage, N. Y.

PULP SHREDDERS
Carthage Machine Co., Carthage, N. Y.

PULP WASHERS
The Green Bay Foundry and Machine Co., Green Bay, Wis.

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Beloit Iron Works, Beloit, Wis.
Buffalo Steam Pump Co., Buffalo, N. Y.
Carthage Machine Co., Carthage, N. Y.

PUMPS (Gasoline)
Wayne Oil Tank & Pump Co., Ft. Wayne, Ind.

PUMPS (Vacuum)
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Buffalo Foundry and Machine Co., Buffalo, N. Y.
Thos. H. Savery, Republic Bldg., Chicago, Ill.
Dean Bros., Indianapolis, Ind.

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RAG CUTTER KNIVES
Dilts Machine Works, Fulton, N. Y.

REFLECTORS
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RESPIRATORS
National Appliance Co., Elgin, Ill.

ROTARY VACUUM PUMPS
Sandusky Foundry & Machine Co., Sandusky, O

RUBBER ROLLS
United States Rubber Co., New York and Chicago

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ROTARY SCREEN
Bird Machine Co., East Walpole, Mass.
Thos. H. Savery, Republic Bldg., Chicago, Ill.

SAVE-ALLS
Bird Machine Co., East Walpole, Mass.
The Green Bay Foundry and Machine Co., Green Bay, Wis.

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Simonds Manufacturing Co., Fitchburg, Mass.

SCREEN PLATES
Central Mfg. Co., Kalamazoo, Mich.
Union Screen Plate Co., Fitchburg, Mass.
William A. Hardy & Sons, Fitchburg, Mass.

SCREEN DIAPHRAGMS
United States Rubber Co., Chicago, Ill.

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Frank H. Davis, 175 Richdale Ave., Cambridge, Mass.

SHAKE (Fourdrinier Cushion)
Wm. C. Nash, Neenah, Wis.

SHOWER PIPES
Sandusky Foundry and Machine Co., Sandusky, Ohio.

SILENT CHAIN DRIVES
The Link Belt Co., Chicago, Ill.

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Cameron Machine Co., Brooklyn, N. Y.
Hamblet Machine Co., Lawrence, Mass.

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Diamond Power Specialty Co., Detroit, Mich.

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Moore and White Co., Philadelphia, Pa.

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American Steam Conveyor Corp., Chicago, Ill.

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Beloit Iron Works, Beloit, Wis.
Buffalo Steam Pump Co., Buffalo, N. Y.

STOCK SHREDDER
The Green Bay Foundry and Machine Co., Green Bay, Wis.

STUFF CHEST AGITATORS
Dilts Machine Works, Fulton, N. Y.

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SULPHITE MACHINERY
Stebbins Engineering Co., Watertown, N. Y.

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Union Sulphur Co., 17 Battery Place, New York City.

SULPHUR BURNERS
Carthage Machine Co., Carthage, N. Y.
Valley Iron Works Co., Appleton, Wis.

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Wayne Oil Tank & Pump Co., Ft. Wayne, Ind.
Graver Corporation, East Chicago, Ind.

TANKS (Steel)
Graver Corporation, East Chicago, Ind.

TANKS (Welded)
Wayne Oil Tank & Pump Co., Ft. Wayne, Ind.

TANKS (Water Storage)
Graver Corporation, East Chicago, Ind.

TESTERS (Moisture)
Williams Apparatus Co., Watertown, N. Y.

TIERING MACHINES
Economy Engineering Co., Chicago, Ill.
Lakewood Mfg. Co., Cleveland, Ohio.

TUBING
Wheeler Condensing & Engineering Co., Carteret, N. J.

TURBINES (Hydraulic)
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S. Morgan Smith Co., York, Pa.

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Open Coil Heater and Purifier Co., Indianapolis, Ind.

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Carthage Machine Co., Carthage, N. Y.
The Crane Co., Chicago, Ill.
G. M. Davis Regulator Co., 414 Milwaukee Ave., Chicago, Ill.
The Wm. Powell Co., Cincinnati, Ohio.
Voorhees Rubber Mfg. Co., Jersey City, N. J.

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Bird Machine Co., East Walpole, Mass.

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American Blower Co., Detroit, Mich.
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B. F. Sturtevant Co., Hyde Park, Boston, Mass.

VARIABLE SPEED ENGINES
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The Brownell Co., Dayton, Ohio.
Chandler and Taylor, Indianapolis, Ind.
Erie Engine Works, Erie, Pa.
Hooven, Owens, Rentschler Co., Hamilton, O.

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Graver Corporation, East Chicago, Ill.
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Valley Iron Works Co., Appleton, Wis.

WOOD SPLITTERS
Carthage Machine Co., Carthage, N. Y.

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Carthage Machine Co., Carthage, N. Y.

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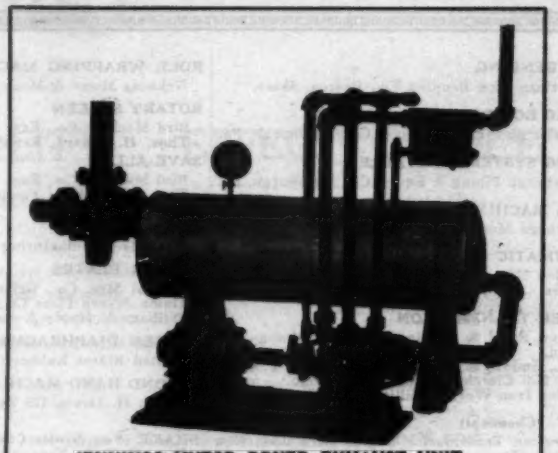

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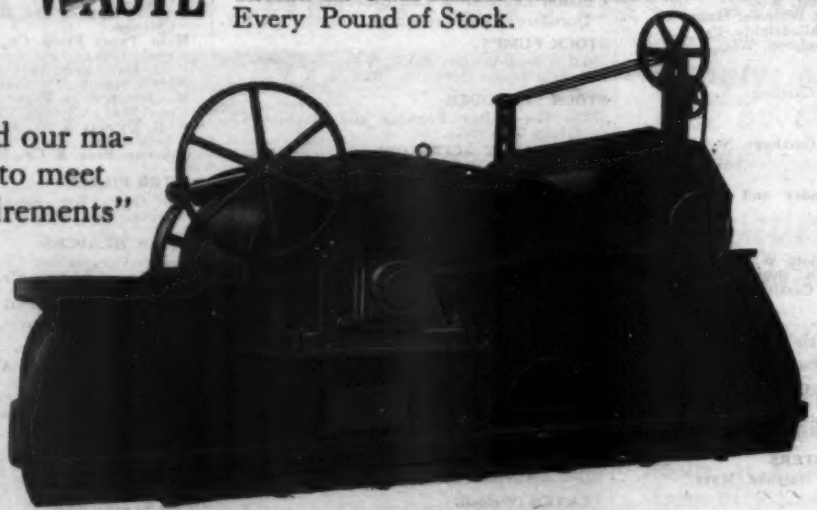

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Numan, H. O., Green Bay, Wis. 1196

Ohio Cultivator Co., The, Bellevue, Ohio 1111
Oliver Bros., 99 Warren St., N. Y. C. 1179
Open Coil Heater and Purifier Co., Indianapolis, Ind. 1194
Oxford Paper Co., 200 Fifth Ave. 1171

Paper Mach. Wire Mfrs. Industrial Council, Chicago, Ill. 1104
Parsons Trading Co., 17 Battery Place, N. Y. C. 1198
Perkins & Son, Inc., B. F., Holyoke, Mass. 1177
Pittsburgh Piping & Equipment Co., Pittsburgh, Pa. 1100
Portable Machine Co., Passaic, N. J. 1169
Powell Co., The, Wm., Cincinnati, Ohio 1202
Premier Shipping Co., 32 Broadway, N. Y. C. 1198
Price & Pierce, 30 E. 42nd St., N. Y. C. 1200
Pulp & Paper Trading Co., 21 E. 40th St., N. Y. C. 1192

Russ Company, E. F., 201 Devonshire St., Boston, Mass. 1192

Salomon Bros. & Co., 200 Fifth Ave., N. Y. C. 1190
Sandusky Foundry & Machine Co., Sandusky, Ohio 1167
Sandy Hill Iron & Brass Works, Hudson Falls, N. Y. 1214
Sanford-Riley Stoker Co., Worcester, Mass. 1165
Savery, Thos. H., Republic Bldg., Chicago, Ill. 1212
Scaife & Sons Co., Wm. B., Oakmont, Pa. 1173
Scandinavian American Trading Co., 50 E. 42nd St., N. Y. C. 1192
Seaman Paper Co., Chicago, Ill. 1084
Shartle Bros. Machine Co., Middletown, Ohio 1204
Shartle Continuous Beater Co., The, Middletown, Ohio 1181
Shuler & Benninghofen, Hamilton, Ohio 1194
Signode System, Chicago, Ill. 1179
Simonds Manufacturing Co., Fitchburg, Mass. 1179
Sims Co., The, Erie, Pa. 1208
Smidth & Co., F. L., 50 Church St., N. Y. C. 1188
Smith, S. Morgan, Co., York, Pa. 1195
Spinelli, Martin, 132 Nassau St., N. Y. C. 1196
Stebbins Engineering Co., Watertown, N. Y. 1203
Storm & Bull, 2 Rector St., N. Y. C. 1198
Strehl Otens Co., Inc., Flatiron Bldg., New York City 1153
Sturtevant Co., B. F., Poston, Mass. 1151
Sutherland Paper Co., Kalamazoo, Mich. 1201
Swenson Evaporator Co., Chicago, Ill. 1194

Taylor Styles & Co., Rieselsville, N. J. 1206
Thomas, E. B., Co., New York City 1190
Tibbitts, M. G., Glens Falls, N. Y. 1179
Ticonderoga Machine Works, Ticonderoga, N. Y. 1188
Tyler, W. S., & Co., Cleveland, Ohio 1170

Union Screen Plate Co., Fitchburg, Mass. 1188
Union Sulphur Co., 17 Battery Place, N. Y. C. 1196
United States Cast Iron Pipe & Foundry Co., Burlington, N. J. 1165
United States Rubber Co., New York. 1149

Valley Iron Works Co., Appleton, Wis. Back Cover
Valley Iron Works, The, Williamsport, Pa. 1177
Voorhees Rubber Co., Jersey City, N. J. 1210

Watervliet Paper Co., Watervliet, Mich. 1082
Wausau Sulphate Fibre Co., Mosinee, Wis. 1160
Wayne Oil Tank & Pump Co., Ft. Wayne, Ind. 1085
Wheeler Condenser & Engineering Co., Carteret, N. J. 1164
Widney Test Laboratories, Chicago, Ill. 1179
Williams Apparatus Co., Watertown, N. Y. 1087
Wolverine Paper Co., Otsego, Mich. 1187

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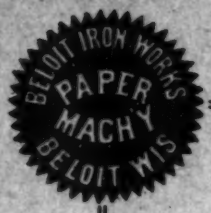
Hudson Falls
New York

Manufacturers of **Paper and Pulp Mill Machinery**



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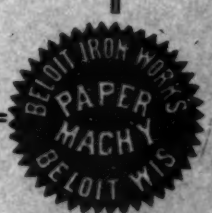

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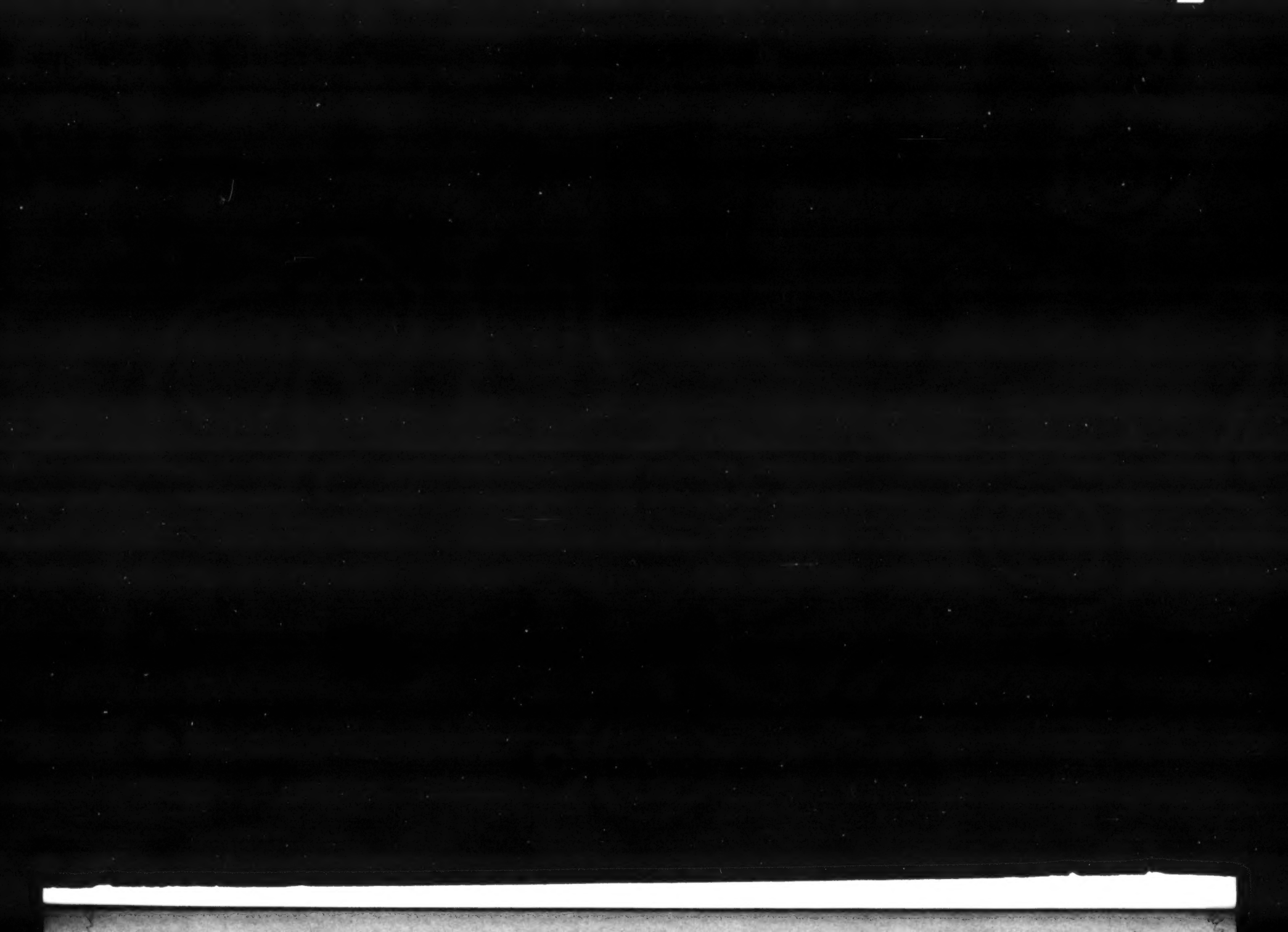
Appleton, Wis., U. S. A.